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Departamento de Comunicação e Arte

CRISTINA IOAN

DESENVOLVENDO A PRODUÇÃO DE SOM NA FLAUTA ATRAVÉS DO CANTO

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Dissertação apresentada à Universidade de Aveiro para cumprimento dos requisitos necessários à obtenção do grau de Mestre em Música, realizada sob a orientação científica do Dr. Jorge Manuel Salgado C. Correia, Professor Auxilliar do Departamento de Comunicação e Arte da Universidade de Aveiro e sob a coorientação científica da Prof. Isabel Maria de Oliveira de Alcobia, Professor Assistente Convidado do Departamento de Comunicação e Arte da Universidade de Aveiro

Ao meu marido e aos meus pais pelo todo amor e apoio infinito.

o júri

presidente

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agradecimentos

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palavras-chave Música, Flauta, Som, Relação Canto-Flauta, Técnica de Estudo

resumo Este estudo pretende propor um método alternativo para melhorar o som na execução da flauta utilizanto elementos da técnica vocal. É uma pesquisa interdisciplinar que consiste em desenvolver, experimentar e analisar exercícios e métodos para estudar flauta através do canto.

keywords Music, Flute, Tone, Relationship Singing-Flute Playing, Study Technique

abstract This music study whants to propose an alternative method for developing the flute tone by using singing techniques. It is a piece of interdisciplinary reasearch consisting in developing, experimenting, and analyzing exercises and methods for practicing flute through singing.

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Introduction:

Recent research in performance practice has suggested the importance of the holistic approaches in the process of music learning and teaching. Some authors, like Alexandra Pierce, explored the domain of aural experience in music. This approach has opened the path for a *natural* way of understanding and overcoming the difficulties of the performance process. The term *natural* refers to ways that are not abstract or conceptual, but instead that imply the commitment of the whole body in a musical action, or in other words, a holistic approach of the musical act.

In her study *Developing Schenkerian Hearing and Performing*, Pierce refers to *Schenkerian movement* as a natural thing, that "...is already within us, can be honed and focused"(Pierce, 1994 p.6) for an artistic performance, which "...can bring the background into more vivid foreground"(Pierce, 1994 p.5). Pierce uses this natural movement for creating a tool to better understand the interpretation and the structure of a musical piece. She supports the "...development of a kinesthetic experience of structural levels: listening, playing, and singing, of course, but especially, moving large muscles to step, swan, lean, or stretch to a musical passage"(Pierce, 1994 p.6). She uses the term *Shenkerian* to describe the approach that is based on the kinesthetic experience of structural levels.

As a flute player, I have always been interested in finding new approaches to performing and understanding music. One element that caught my interest in Pierce's study was the singing approach. This is an aspect that I have previously acknowledged from some

flute methods and writings of contemporary flute players - Philippe Bernold, Peter-Lukas Graf, Robert Dick, and James Galway.

All of this information about singing and holistic approach to instrumental performance made me curious about the consequences of applying aspects of singing technique to flute playing. I then started doing research on singing technique and taking voice lessons.

The purpose of this study is to investigate whether applying the singing technique to flute playing can help improve the tone quality, and if it can help correct the problems of tone production. I will not talk about other aspects that relate to flute playing - e.g. articulation or finger-agility - as these aspects have nothing to do with the singing technique.

In this study, I devised some exercises that consist of melodic fragments to be sung and subsequently played on the flute. The main underlying idea is that the participant should experience the same sensations he/she experiences singing while playing that passage on the flute. I tested these exercises on myself and felt they were useful for improving the flute tone as they also gave an aural perception of the playing. Afterwards I taught these exercises to a group of flute students and the students were subsequently interviewed to see if they felt any changes in tone production. In general, there was an improvement in the quality of the sound when they were able to experience the sensations of singing while playing the flute.

This study is organized in four chapters. In the first Chapter, I address the problem of tone development by I investigating the existing methods for tone development and reviewing work that has been done in the direction of developing the tone through singing

techniques. In addition, I describe how I believe the singing technique could be further explored for improving the tone.

In the second chapter, I present some of the exercises I *borrowed* from the singing technique for my flute practice. Singers regularly use these exercises for daily practice. There are two breathing exercises and eight vocalize exercises I chose because they are designed for warming up the breathing muscles, the vocal tract, and for activating the resonators.

The third chapter discusses and analyzes the experiments I conducted with volunteer flute students using some of the exercises from the previous chapter.

Finally, in the fourth chapter, I describe how I used the singing technique while studying the flute repertoire, and I present the conclusions of my personal experience when using vowels for changing the flute tone colors.

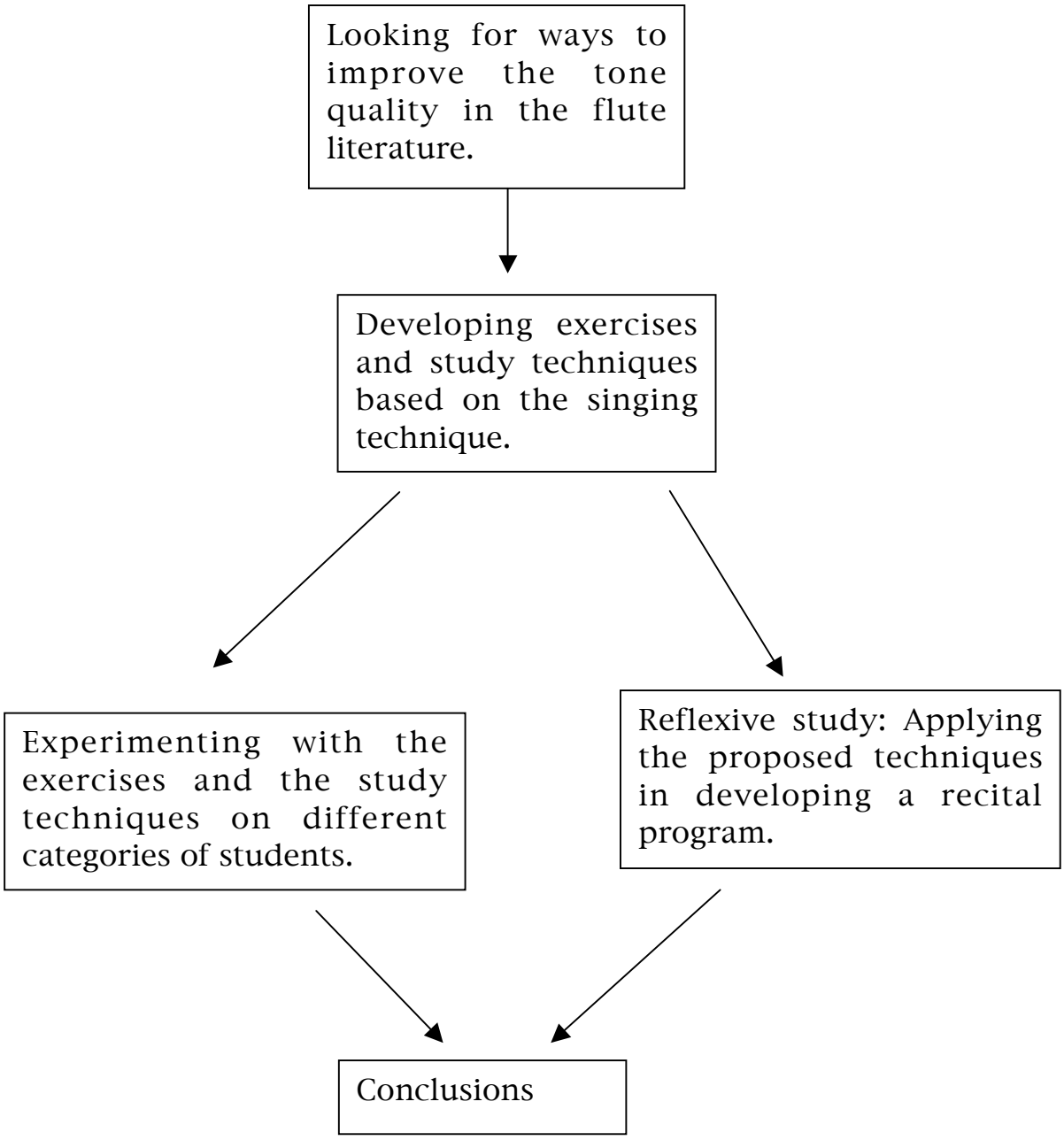
This text has an accompanying DVD, containing examples of application of the techniques presented here.

Convention:

For the purposes of this study the vowels *a, e, i, o, u,* should be pronounced as follows when they appear in the exercises:

- the vowel *a* as in “f<u>a</u>ther”,
- the vowel *e as in “wh<u>e</u>re”,*
- the vowel as in “s<u>ee</u>” or “h<u>ea</u>t”,
- the vowel *o*, as in “h<u>o</u>me”,
- the vowel *u* as in “f<u>oo</u>t”.

Schematic structure of this study



Chapter I:

Looking in the flute literature for ways to improve tone quality

"The tone is the voice without which one cannot even begin to sing"

Boehm (1964, p.140)

Before analyzing the existing methods for improving the flute tone, I will give a short explanation of the phenomenon of producing a flute sound. Sound is the prime material for music creation. Producing a sound implies a very complex series of actions.

As described by many sources[1], the flute sound results from the impact of the air stream directed by the lips into the orifice of the flute head, this impact creates vibrations flowing through the whole body of the flute. Depending on the dimension of the flute tube, and on the direction, quantity and pressure of the air column, the produced sound has a determinate pitch, intensity and timbre. In addition, other factors can influence the pitch, including the position of the lower jaw, which changes the direction of the air. This is a small adjustment with the range of more or less of a whole step. Another factor that influences the pitch is the pressure of the air together with the *embouchure* changes that can alternate the pitch on the natural harmonics of a specified note.

[1] See for example Toff (1985,1996, p.89-100), acoustic studies found on the University of New South Wales's website (http://www.phys.unsw.edu.au/music/flute/, retrieved August 18, 2006) and also on the Mark Shepard's Flute Page (http://www.markshep.com/flute/Acoustics.html, retrieved August 18, 2006)

The main factor that influences the intensity and timbre is the different treatment of the air column. Coordination of the air column is a very complex process because it implies changes on the everyday habit of breathing as this involves a larger number of muscles. I will explain the air treatment and the muscles that are involved in Chapter II.

From this description, one can realize that the phenomenon of producing a flute tone is a complex reality and it depends a lot on the player's ability and knowledge. In the next pages, I will explore the existing methods for flute tone production and then try to further expand the possibilities of producing a flute tone by using singing techniques.

Discussing the existing methods for sound production in the flute

When playing a wind instrument, it is essential to have good breathing control in order to achieve an excellent sound quality. There are many treatises on breathing and on breathing control and coordination explaining the process for the corresponding instrument. Texts dedicated to the flute also focus on the flutist's breathing and sound production. Most of the "classical" flute methods and treatises give solutions and advices for problems concerning breathing and sound production. I am referring to the well-known Marcel Moyse books, *Le Débutant Flutiste, De la sonorite, Art et technique*, and *Exercices Journaliers*; the Giuseppe Gariboldi books *Méthode de Flute, op 128,* and *L'Indispensable, op 48*; the Taffanel-Gaubert book *17 Grands Exercices Journaliers de Mécanisme.* The methods offered by these canonic books and others

alike refer strictly to the flute, limiting, in my view, the horizon of solutions and possibilities of this instrument.

Few authors give alternative ways of understanding the process. They discuss different ways of experimenting with breathing control and coordination and methods for producing a quality sound. More contemporary flute players, like Philippe Bernold, Peter-Lukas Graf, Robert Dick, James Galway, refer to the relation between flute playing and singing. The exercises they propose are designed to improve breathing control and sound quality (timbre, intonation, dynamics, and tone color) and to help maintaining a relaxed position of the larynx.

Philippe Bernold uses melodic singing patterns in his method for flute *"La Techinque d'Embouchure"*. He created 24 exercises called *vocalizes*, which are focused on the evenness of timbre and dynamics in all three registers. As the title suggests, these exercises are based on the warming-up exercises of the singers. However, these vocalizes are not intended to be sung, but played with the flute. The author describes the exercises in the following way: "These are simple and musical exercises, employing relatively small intervals, which permit the flutist to commence his daily practice with ease"(Bernold, 1995). The term *vocalizes* is used generically, and only few of the exercises follow exactly the pattern of the singing vocalizes.

Peter-Lukas Graf mentions the relation with singing in his method *"20 Basic Studies for Flutists."* In chapter *Embouchure,* Exercise 6 is called *Singing and Playing*. He designed the exercise with the purpose of obtaining "...a relaxed optimum position of the larynx" (Graf, 1991). The exercise is to be sung and played at the same time. Like Philippe Bernold's exercises, it is based on small

intervals and arpeggios. The exercise alternates long notes either played or sung, based on the arpeggios, giving the flutist the possibility to feel the sensation of the un-contracted larynx during singing, and to make sure that she/he experiences the same sensation when playing.

Sir James Galway also supports the relationship between singing and playing. In an article about *Intonation,* posted on the "Great Boston flute Association" web site[1] he refers to the influence that singing has in flute playing. He encourages flutists to take singing lessons because singing requires that you hear the specified pitch in your head before emitting sound. He does not write any precise exercise, but he suggests: "Learn to sing melodies with a simple arpeggio in them. The slow movement of the Brahms violin concerto, for example. The 'tune' from the Schubert variations is another good example"(ibid).

Robert Dick developed some very interesting and helpful evolutionary techniques for the contemporary flute playing. Not only he opened new horizons for the flute's musical repertoire, but he also found new techniques, which help to improve the flute sound. One of the possible ways to do this is singing and playing at the same time. In *Tone Development Through Extended Techniques* he refers to "throat tuning" (Dick, 1986, page 9) for "maximizing resonance and tone color" (ibid). Dick sustains the idea that the flute sound is not only the air vibrating into the flute, but is also the air vibrating inside the flutist body – mouth, neck and chest as well. He insists on the idea that all flutists should be able to sing in tune. In his opinion, singing for flutists is very important since "singing and flute playing

[1] http://www.gbfa.org/intonation.html, retrieved June 16, 2006

are acoustically so similar" and "practicing singing and playing with the voice in intervallic relationships to the flute other than unison or in octaves is an incredible ear-strengthener" (ibid). Another concept he adopts from singing is the open throat: "The open throat concept for flute playing was a huge improvement over the tight throat style heard much earlier this century; and the tuned throat is the evolutionary successor to the open throat. It will, for example, make the low register much more secure than simply opening the throat as much as possible" (ibid).

Elaborating on the ideas of Robert Dick and of the above-mentioned authors, I shall develop further this parallel between flute playing and singing.

Exploring further the parallel between flute playing and singing

The process of producing a sound is very complex. If the flutist does not master it his/her mind and body will become tense. This may happen because he/she is probably preoccupied with the control of different aspects, like the muscles involved in the respiration process, or with issues concerning the control of the air column – direction, speed, pressure, and quantity -, or even with problems of intonation. These tensions have negative effects on the quality of the flute tone. In my opinion, the singing technique could function as a shortcut to eliminate these tensions. I suggest that because flutists are so focused on the technical difficulties of playing their instrument - fingering, embouchure, support, etc. - that they are not aware of the active involvement of other parts of the body.

They tend to neglect the muscles involved in the respiration process -that are also responsible of the coordination of the air column-, the vocal tract and the resonating cavities. Singing is the way to make them aware of these body parts, which, as I shall demonstrate further, are so important for flute sound production. To support this argument I shall put forward four ideas:

1. The muscles involved in controlling the breathing process and the air column work similarly in singing and in flute playing. By studying singing, the flutist can experience breathing from a different point of view, and he/she can have a different perception of the breathing process since the specific technical aspects of the flute playing do not distract him/her.

2. When singing, the internal ear controls the coordination of the air column and adjusts its pressure, volume and speed. If the flute player practices singing, he/she can gain the reflex of how to adjust the air column in order to produce a specified pitch and then when playing the breathing muscles will react spontaneously. Another effect of previously singing the pitch is that the internal ear is trained, which will positively affect the tuning when playing the flute.

3. From my flute experience and from empirical observation of other flutists I noticed that the flutist has the tendency to contract and to block his/her larynx when playing. This creates not only a constriction for the flutist but also a contracted larynx negatively influences the flute tone, a fact that a trained ear easily detects. When singing with a good technique, one can experience the sensation of producing a sound with a relaxed and open position of the larynx. In my singing lessons, a golden rule was keeping the

throat relaxed, or in other words, singing with an *open throat*. I shall explain this concept later, in the second chapter, when introducing the exercises that serve this purpose.

4. When singing in tune with a good technique, the vocal tract, the larynx and the resonance cavities adjust naturally to that frequency as stated by Doscher (1994):

> There is universal agreement that the two principle resonating cavities are the throat or pharynx and the mouth, each of which is tunable; that is their size and shape, as well as the dimensions of their orifices, can be varied by certain adjustments of the tongue, lips, soft palate, and jaw. These adjustments are under voluntary control of the singer and must be practiced until they become automatic.(p.107)

The reason why tuning the resonators is a very important issue, is because the flute sound will begin to resonate in these cavities through *sympathetic* resonance, thus increasing the resonance of the flute sound. The laws of acoustics explain this fact. William Vennard (1967), singer and theoretician, describes accurately this process:

> Air cavities are used to amplify the tone of weak vibrators. For instance, a tuning fork cannot be heard unless you hold it close to your ear, or unless you *resonate* it by attaching it to a box whose natural frequency is the same. The prongs do not disturb enough air to affect the ear at any distance, but by *free resonance*, the air in the box is set into *sympathetic vibration*, making enough sound to be heard. The same box will resonate other forks, provided they are in its overtone series. (p. 14)

Based on the Robert Dick's idea – that the flute sound also resonates in the flutist's body – and on the above acoustic facts I drew the following empirical conclusion: *the flute tone can benefit form the sympathetic resonance of the vocal tract if one shapes the vocal resonators for playing as if for singing*.

The four ideas I presented above are the main ideas that I will explore and try to demonstrate further in this study.

In the following chapter, I will propose some exercises similar to the ones singers use in their daily practice routine. I attended singing lessons for almost two years where I got to know many interesting exercises – from breathing exercises to vocalizes - and became familiar with the singing technique. I also found out more about the singing process by studying singing literature. I then designed these exercises for my flute practice and, after being able to sing them in a good manner, I noticed an improvement in my sound as well as in the aural perception of my playing. I believe that these exercises could also help the flutists in their struggle for obtaining a good sound, by giving alternative ways of feeling and understanding the sound production process.

Chapter II:

Developing exercises and study techniques based on the singing technique

In this chapter, I suggest some exercises that could help the flute students to improve their sound quality. In addition, I explain how these exercises should be performed and the purpose of each exercise. I developed these exercises after practicing vocalizes in singing classes. Although I experimented with many possibilities, I am only presenting here the exercises I found more helpful in improving the tone.

Breathing exercises:

Introduction

After discovering some interesting breathing exercises while reading books about singing technique, I decided to include these exercises in my daily study routine. After a period of practicing with these exercises, I felt it was easier to form a good breathing habit, than when practicing with regular singing exercises. What I liked best about these exercises was the fact that they gave an aural perception of the entire process of breathing. They are very simple in the sense that one does not have to be acquainted with the complete breathing process in order to be able to practice them.

In order to better ascertain the benefits of these exercises, I tried them with beginner flute students. These students never trained the habit of complete breathing and they represented a good testing group for proving the efficacy of these breathing exercises. I divided

the students in two groups: with the first group, I did the traditional breathing exercises that are normally used in flute lessons, with the second group I experimented the breathing exercises that I discovered in the books about singing technique plus the traditional breathing exercises.

After some time of regular practice (about three weeks) on the breathing habit with these exercises, the first group was still having problems in assimilating the new habit of breathing. They were only doing the correct breathing in thirty percent of the cases. After the same period, the second group had fewer problems in assimilating new the breathing habit, being able to do a correct breathing in fifty percent of the cases. In the end of the experiment, the first group was able to do the correct breathing in fifty percent of the cases and the second group in seventy percent of the cases.

Therefore, I believe that these new exercises are efficient for building up the habit of complete breathing and I feel encouraged to present them in the following pages and will explain how the exercises work at the anatomical level. In order to provide the reader with a better understanding of the muscles terminology and their role, I will first give a brief description of the breathing process. This explanation is grounded on the following anatomy and physiology studies: Gray`s Anatomy (2005, p.633-647), Netter (2004, p.191-204) and Guyton (2000, p.432-444).

The breathing process

Purpose

The purpose of the breathing process is to provide the oxygen necessary for keeping us alive. This process can be divided in three

phases: Inspiration, Retention and Expiration and it takes place in the respiratory system. In the Inspiration phase the air is introduced into the lungs. Retention represents the moment of repose between the inspiration and expiration; this phase is normally very short, almost imperceptive in all day breathing. Expiration is the process of putting out the inspired air.

Main muscles involved

The principal muscles responsible for the inspiration are the *Diaphragm* and the *External Intercostals*. In the expiration process the *Internal Intercostals* and the *Abdominals* have a major role.

Inspiration

During inspiration, the *external intercostals* contract, the ribs are pulled up and forward and the *diaphragm* is pushed down. This results in a bigger volume in the thorax, and an expansion of the lungs. The larger space created into the lungs causes the air suction in inspiration.

Retention

When the lungs are full of air, the *diaphragm* compresses the viscera and the *external intercostals* contract. This is the moment of Retention. During Retention, one can feel all the musculature of the thorax and abdomen very active; also, the vocal folds and the false vocal folds close, so, the air does not get out. Retention creates an internal tension in the body and then the air is naturally pushed out. This is the moment of Expiration.

Expiration

In the expiration process, the muscles involved are the *internal intercostals* and the *abdominals*. The *internal intercostals* play the role of adducting the ribs, thus lowering the rib cage and the

sternum. The *abdominals* are pushing the viscera inside, and pushing the *diaphragm* upwards. The air with carbon dioxide is expelled out of the lungs and the body needs now another quantity of air with oxygen, and so, the cycle starts again. (See Figures 1 and 2)

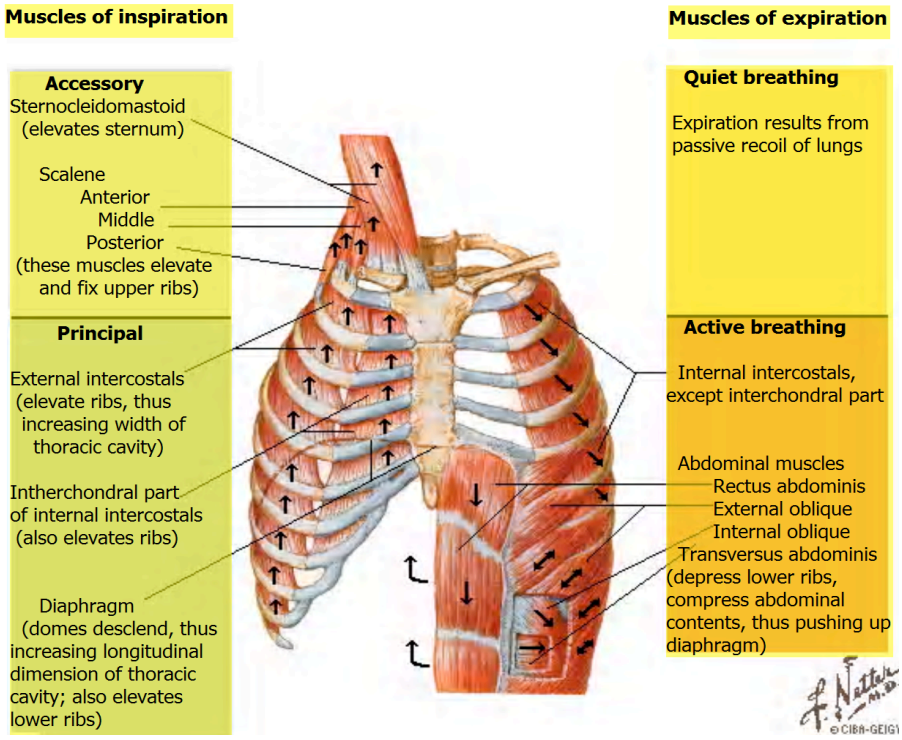


Figure 1 Muscles involved in the breathing process (I) (Netter, 2004, p.191-204)

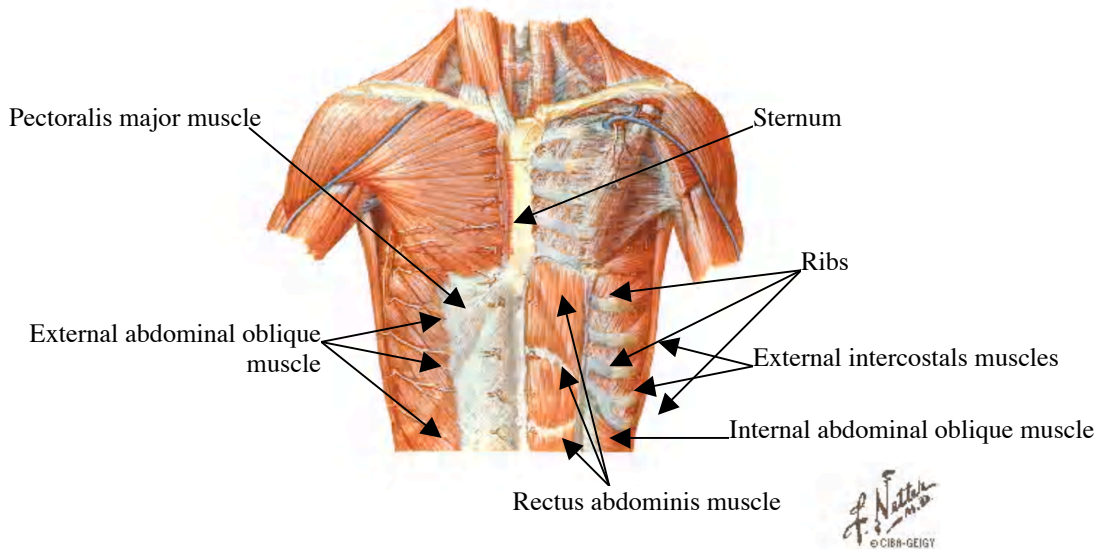


Figure 2 Muscles involved in the breathing process (II)

A secondary, but not to be neglected, role in the breathing process is played by the following muscles: *Pectoralis major, Pectoralis minor, Serratus anterior* and *posterior, Trapezius, Latissimus dorsi* and *Transverse thoracis*.

On a normal every day breathing, one may not feel the muscular movements so accurately. However, someone who trains the breathing habits should be aware of these processes.

Next, I will describe two of the exercises that I practiced in the singing lessons and explain the aspects that I felt useful for improving the flute tone.

Exercises 1 & 2

Exercise 1

For singers, this exercise is called "Controlled panting"(Foote, 1989, p.34). The name is very descriptive; it is like the breathing of a tired dog. It consists of a very quick abdominal breathing. This exercise is useful for activating the muscles responsible for the inspiration[1]. It also improves the perception of how it feels to breathe fast.

Exercise 1 helps to create the reflex of quick inspiration based on the sensation that one experiences while doing it. By creating this automatism, the flutist does not have to be preoccupied with all these muscles and their functionality when producing a sound.

As a methodology, the exercise has to be performed very fast and through the nose. This is in order to enhance the muscles' activity due to the resistance of the air while passing through the

[1] See the introduction part of the breathing exercises.

small orifice of the nostrils. Inspiration should be equal with the expiration. This way, the panting can be done for a longer period. This exercise also helps maintaining the abdominal muscles toned and induces a right manner of complete breathing.

After regular self-practice doing this exercise, I noticed that it was helpful for improving the muscular reflex for quick inspiration. This kind of training is very useful when playing fast passages - were the inspiration has to be really fast and inhaling a large volume of air.

As I mentioned before, I also experimented this exercise on beginner students. They found the exercise easy to practice and they were able to feel the abdominal muscles active while breathing. After about three weeks, they were able to use their abdominals for inspiration while playing flute. I will describe this experiment later in Chapter III.

Exercise 2

The following exercise can also be used to activate the muscles for a complete breathing:

While standing very close to a wall, place a thick cover book between the wall and the upper abdominal muscles. One should "...take a breath, move away from the wall but do not drop the book. Exhale, and do not move back toward the wall"(Foote, 1989, p.35).

I find this exercise very useful for coordinating and building up the resistance of the expiratory muscles. When playing or singing, the last two phases of the breathing process combine.[1] The retention and the expiration are mixed because the air speed has to be

[1]See the introduction part of the breathing exercises.

controlled. This creates a tension in the thoracic cavity. This exercise helps to easily experiment the feeling of muscular tension created by the retention and the slow expiration.

As a methodology, the expiration should be done very slowly, and with full consciousness of the activity of the muscles involved. In my opinion, this exercise is also useful for improving the support and the consistency of the tone. These two qualities of the tone can really make the difference between a powerful sound, which can be heard from a long distance and a weak sound, which does not get to far in a concert hall.

When I introduced this exercise in the regular practice of beginner flute students, the result was very encouraging. After a short period they were able to play with a sustained tone and without substantial air-pressure fluctuations.

Besides these two breathing exercises found in Foote's book, I also discovered other interesting tone development exercises. After my previous practice with the vocalize exercise by Philippe Bernold and the throat tuning exercises by Robert Dick, I imagined that these new singing exercises could be applied for developing the flute tone. I present here the exercises that I considered that are more helpful for improving the flute tone[1]. I am also including an exercise that was created by me.

[1] The exercises I present here are a selection from a broader set of exercises. After a period of self-experimentation, analysis, and selection of various types of vocalizes, I opted for only including these exercises as I found them to be most useful.

Tone development exercises:

I call these exercises generically “warm-up exercises” since they fall upon various aspects of the daily warm-up routine for tone development. As I said in chapter I, there are at least four major reasons why singing can be helpful for improving the breathing and the tone:

1. It gives an alternative way for experimenting and training the complete breathing;

2. It makes possible a spontaneous air coordination and control;

3. It helps in overcoming the muscular tensions that one might experience wile playing the flute;

4. If the exercises are done correctly the tone is enriched by using the vocal tract as a secondary resonance cavity and the internal ear is sharpened.

Phonation

In order for the reader to better understand the following exercises, I will give a short description of the vocal “instrument”.

The following statement, perhaps best describes the process of producing a vocal sound, or *phonation*: “The voice is a wind instrument. The air from the lungs is the actuator of the vocal folds, which become the primary vibrator and produce the sound wave”(Docher, 1994, p.99).

Phonation takes place in the larynx. From here, the sound is “processed” by the resonating cavities. There are two principal

resonating cavities: the throat (pharynx) and the mouth (oral cavity). These cavities are tunable by certain adjustments of the tongue, lips, soft palate and jaw (see Figure 3).

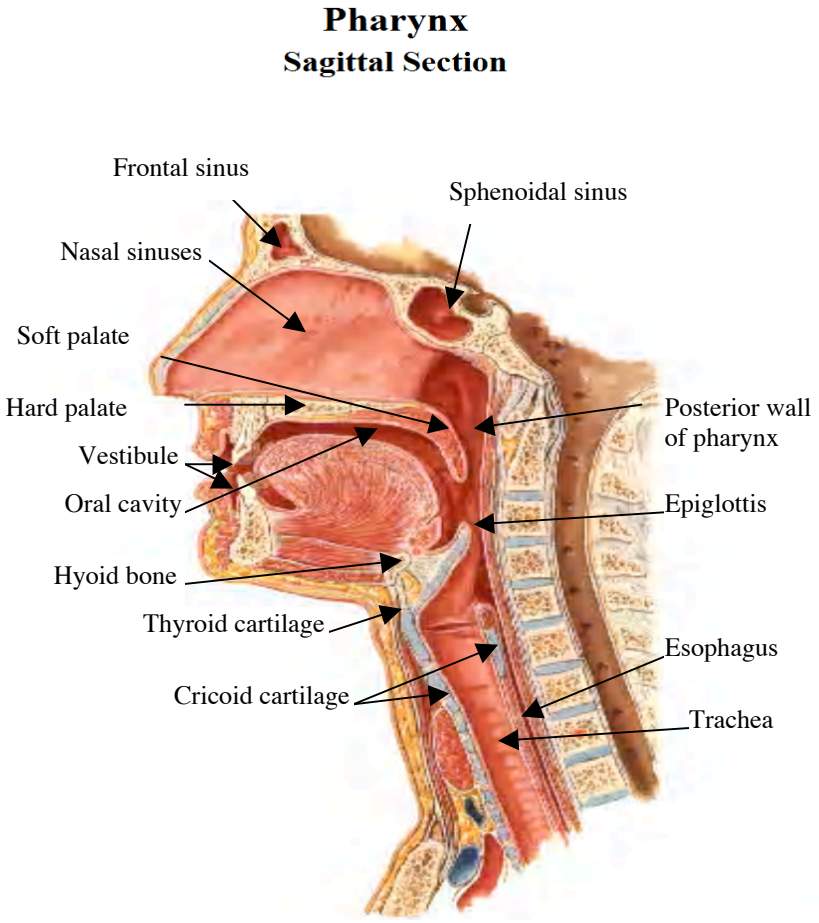


Figure 3 The vocal tract and the resonation cavities (Netter, 2004, p.73-76)

Open throat concept

An *open throat* plays a very important role in achieving the best possible resonance for producing a sound rich in overtones. The concept of *open throat* refers to the relaxed and lowered position of the larynx's muscles.

Singing theorists and researchers, like Vennard and Sundenberg, indicate the presence of an auxiliary resonator called *laryngeal collar,* located right above the vocal folds and formed by

the epiglottis and aryepiglottic folds. This collar has an approximate resonance frequency of 2500 to 3000 cycles per second (Hertz). This resonance is considered to be the singing formant. Sundenberg believes that a lowered position of the larynx can cause the formation of this resonating frequency.

The position of the larynx plays an important role, not only for the formation of the laryngeal collar, but also because “if the tone is produced in a constricted throat, nothing that the mouth can do will make it satisfactory”(Vennard, 1967, p.98).

When playing the flute, the relaxed position of the larynx - *open throat* - is very important. The reason for this fact is more than obvious: if the larynx is constricted, and the muscles of the throat become tense, then the column of air is obstructed. In addition, if these muscles are tense, they loose the flexibility and therefore are not able to adjust their position for producing a good tone quality.

Through singing the flute player can experience the sensation of *open throat* and can have an alternative way for training the relaxed position of the larynx.

General description and methodology of the exercises

Exercises 3 to 10 are the exercises I propose for tone development. With the exception of the exercise 6, entirely created by myself, I developed the exercises using the patterns of vocalize found in Foote’s book, *The Vocal Performer.* Note that the exercises should be performed with the flute one octave higher than written and that female voices should sing the exercises as written while the male voices should sing one octave lower than written.

One should practice these exercises in three phases:

First, sing one measure in *mezzo piano* with the mouth closed. While doing the exercise, one should focus on the production of the sound in such a way that one can feel an itching vibration in the nose region and the larynx relaxed *open throat*.

Next, sing the same measure with the mouth open while pronouncing the indicated vowels. One should experience the same sensations while producing the sound as when singing with the mouth closed. In order to better interiorize this sensation, one should eventually close the eyes. When one feels secure in singing that measure and becomes conscious of the sensations of open throat, vibration in the resonating cavities, and breathing control while emitting a quality sound, one should move to the next step.

Finally, in the third and last step, one plays that measure with the flute[1]. When playing, one should focus in maintaining an open throat and try to feel the sound of the flute resonating in the vocal tract cavities. One should breathe very slowly, through the nose. In addition, one should hear the notes internally, before playing them. This is an important aspect, since the body will automatically react by preparing the right quantity of air, and by tuning the vocal tract. This way, the sound will be in tune and will be reinforced by the resonance spaces of the vocal tract, i.e. in sympathetic resonance with the vocal tract.

The suggestions I give at the beginning of each exercise are the conclusion of empirical observation and analysis after practicing these exercises for about a year.

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[1] It should be noticed that the notes played with the flute are one or two octaves higher than the sung notes, depending if a female or a male performs them respectively.

General purpose of the exercises

The general purpose of the exercises is to maintain the same *sensations* as when singing while playing the flute. By the term *sensations*, I am referring to the control of breathing and control of the air coordination (quantity, speed and direction), the control of the internal ear and to the sensation of resonance inside the vocal tract. Further, I will explain the reasons why these sensations are important for playing the flute.

Breathing and air coordination

As I mentioned, in the beginning of this chapter, the breathing process for flute playing is based on the same concepts as the breathing process for singing. Through my singing experience I discovered that the air coordination for singing is very similar with the air coordination for flute playing. For example, the speed, the quantity, and the direction of air required for playing a note in the flute is the same than that required to sing that note one octave or two octaves below depending on the voice. The reason why this similarity is important is that one may train the breathing habit in an alternative way, using the methods used by the singers.

Developing the internal ear

The control of the internal ear is an aspect that can be of significant help for the tone production and development. The reason for this is that little can be done for improving the quality of the tone after producing it. I am referring for example that when playing in public there is not much time to try to correct the tone. Another reason is that the internal ear should be the starting point

for the coordination of all the muscles involved in producing a sound. The internal ear plays the role of a control command; it creates the image of the sound that one wants to produce. By “image” I am referring to the characteristics of the tone like: intonation, consistence, dynamics and color. If this image is not clear the command for the muscles is not clear also, and there is little or no coordination in producing a sound. As a result, the sound will be of indeterminate characteristics. Thus, It is necessary that one has the image of the sound very clear and precise in his/her mind before producing it.

For singing, the internal ear is an indispensable condition. The sound is produced first in mind and then the sound is sung. On the contrary, the result will not be satisfactory. Thus, by singing is possible an excellent coordination and training of all these parameters; starting with breathing and coordination of the column of air, then ear training and strengthening.

Sympathetic resonance

By creating an additional resonating cavity that can be controlled and tuned, we can increase and improve the resonance of the flute sound. As I mentioned in the first chapter this fact is a consequence of the phenomenon of sympathetic resonance. That is, if a sound is connected to a resonating cavity tuned on the same frequency then that cavity will start resonating and this reinforces the resonance of that particular sound. For example if one plays some notes with the flute inside the piano with the mechanism (the pedal) of the resonance on and presses the keys for that notes

without producing the sound, then the piano will start resonating the sound of the flute.

Appling this phenomenon for playing the flute I got to the following presumption: The flute sound being produced at the outside limit of the vocal tract (the lips) is connected in this way to the whole resonance cavities of the vocal tract. If the vocal resonators are tuned on the frequency of the sound played with the flute then they will also resonate and doing so they are increasing the resonance of the flute sound.

My personal experience when singing and playing the exercises

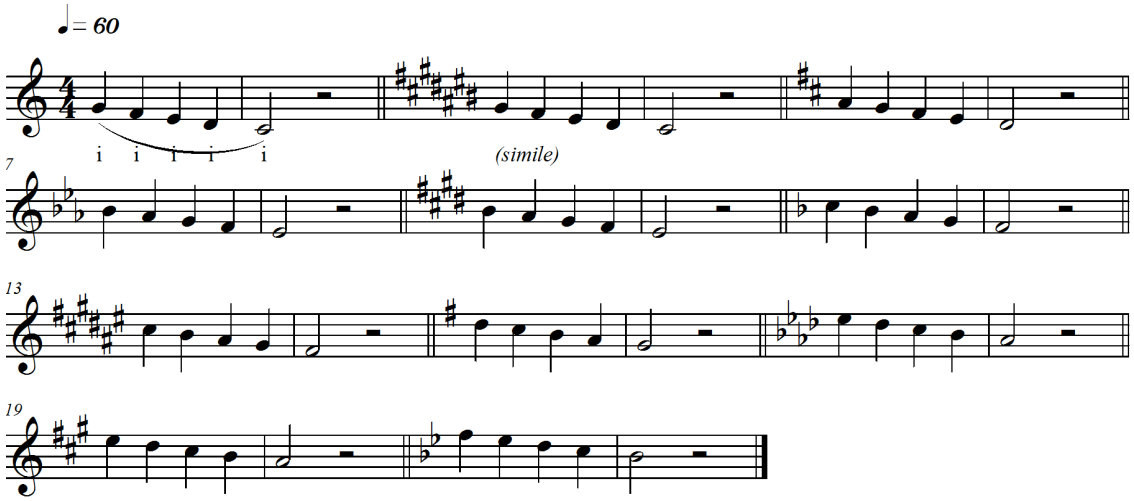
When I sang these exercises, I noticed a gentle activation of the vocal folds and of the resonating cavities. This helped me to tune up my vocal tract and, at the same time, to experiment the sensation of tuning.

Afterwards, when I played the same exercises with the flute I was able to do the same tuning of the vocal tract and to create the resonance space thus enabling a sympathetic resonance with the flute sound. I also felt that I was better controlling the muscles involved in the respiration process. This was because I previously sang the exercise, and my muscles developed the reflex of coordinating the air direction, pressure, speed and quantity.

Exercises 3 – 10

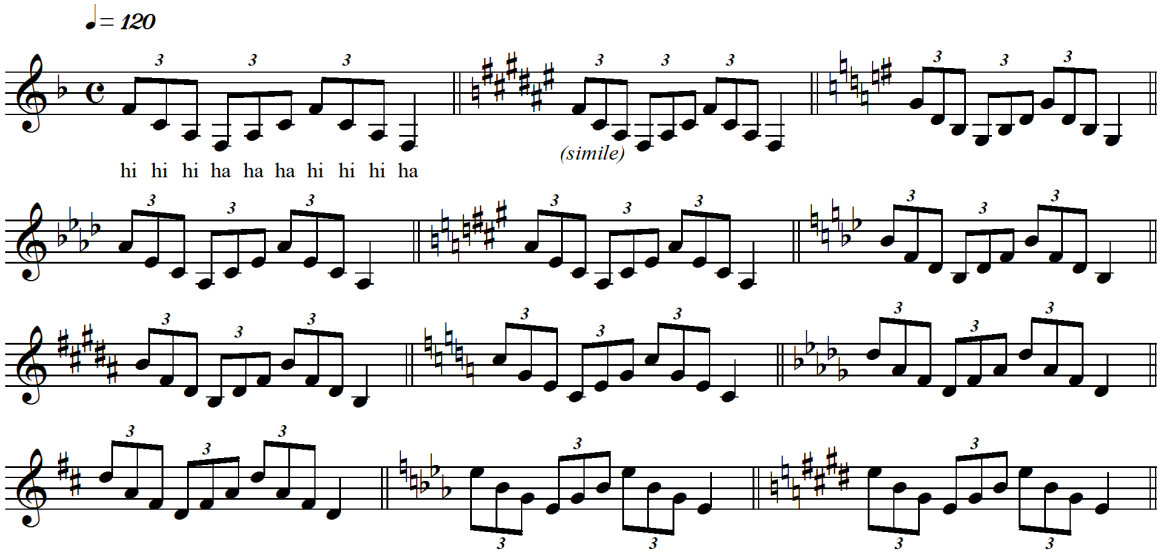
Exercise 3

This exercise has the goal of making the flutist to feel the sensation of resonance in the nasal cavity and also to have the “open throat” position. It is also helpful for improving the coordination of the air column.



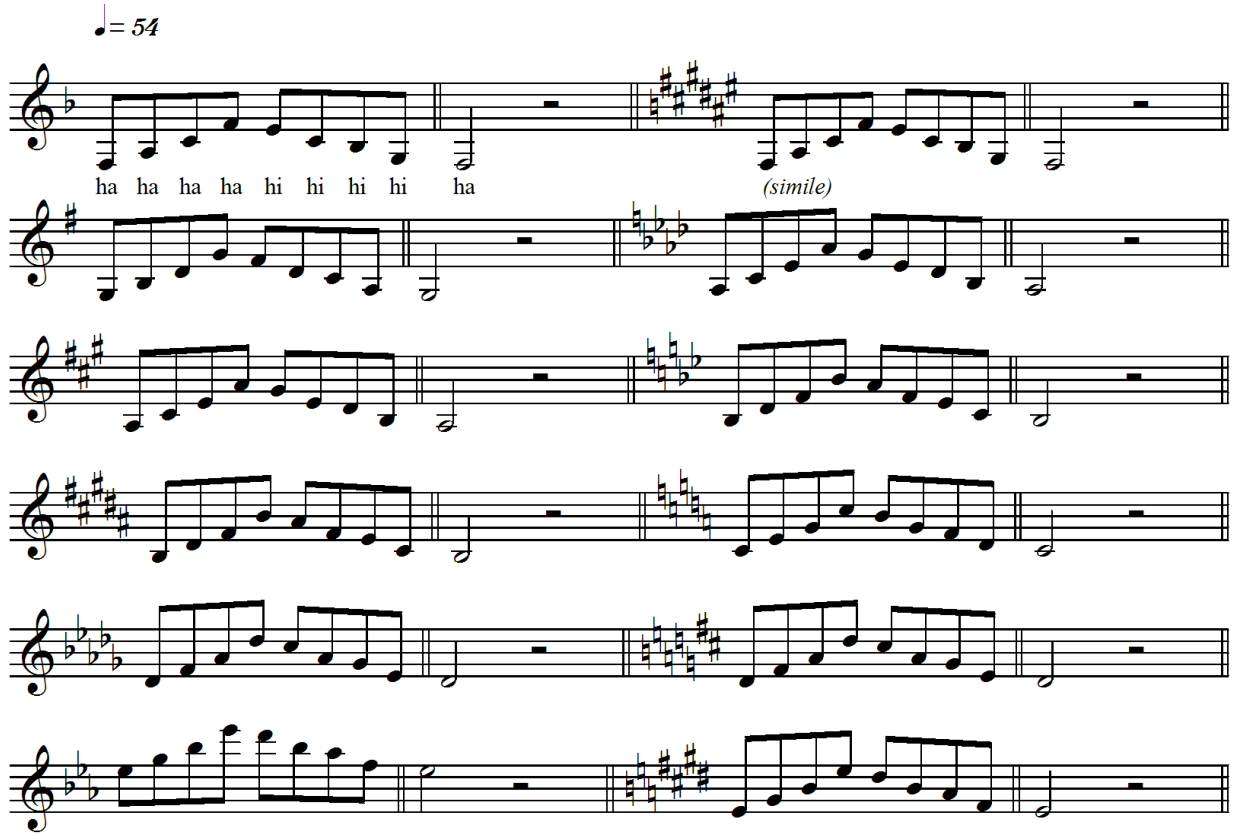
Exercise 4

This exercise has the goals of improving the intonation (by strengthening the internal ear) and homogenizing the registers. It also focuses on improving the movement of the breathing muscles and helps developing the lips’ flexibility.



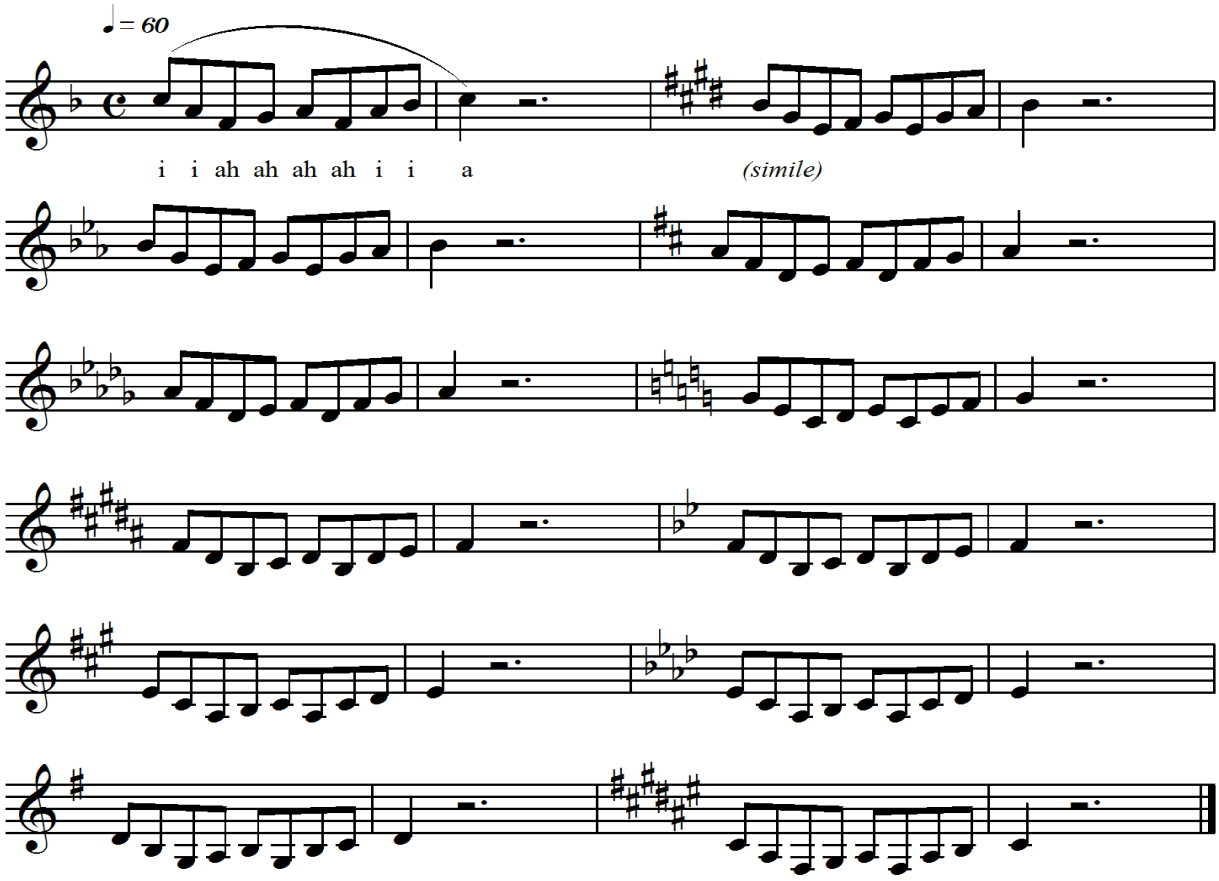
Exercise 5

This exercise can be used for activating the resonating cavities as it mixes the chest and the head resonance. It also improves the internal ear.



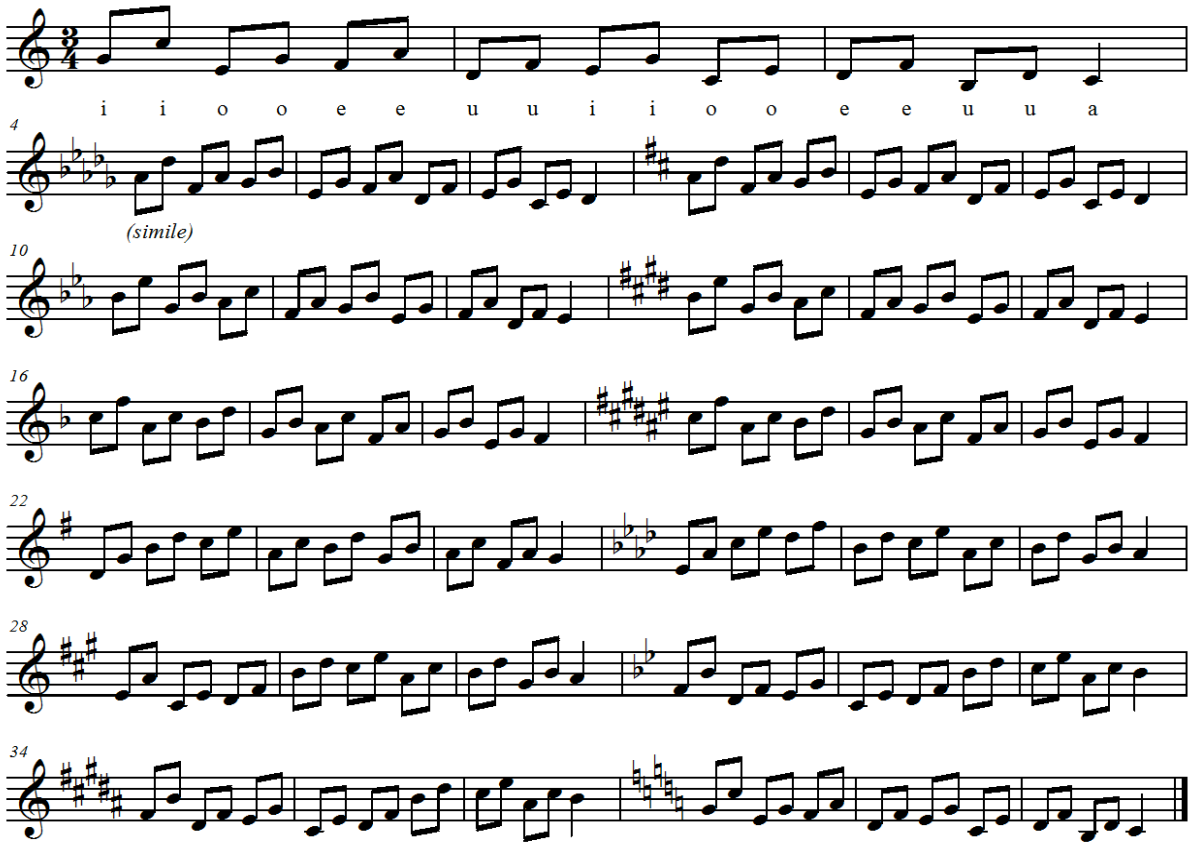
Exercise 6

I created this exercise for activating the head resonance, for improving the intonation and the flexibility of the tone when mixing the registers and playing small intervals.

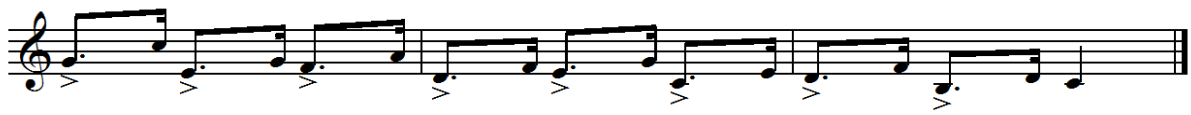


Exercise 7

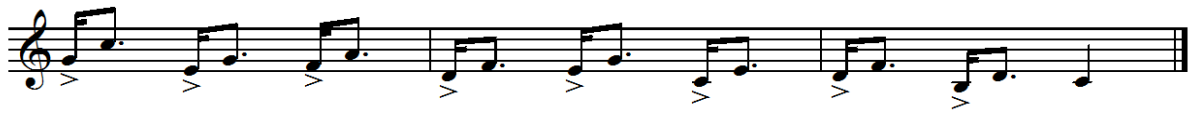
This exercise is very useful for improving the internal ear, for achieving on *open throat* position and for mixing the resonance cavities. It also focuses on vowel flexibility.



Lower notes heavier.
Follow the same sequences of notes as exercise 3

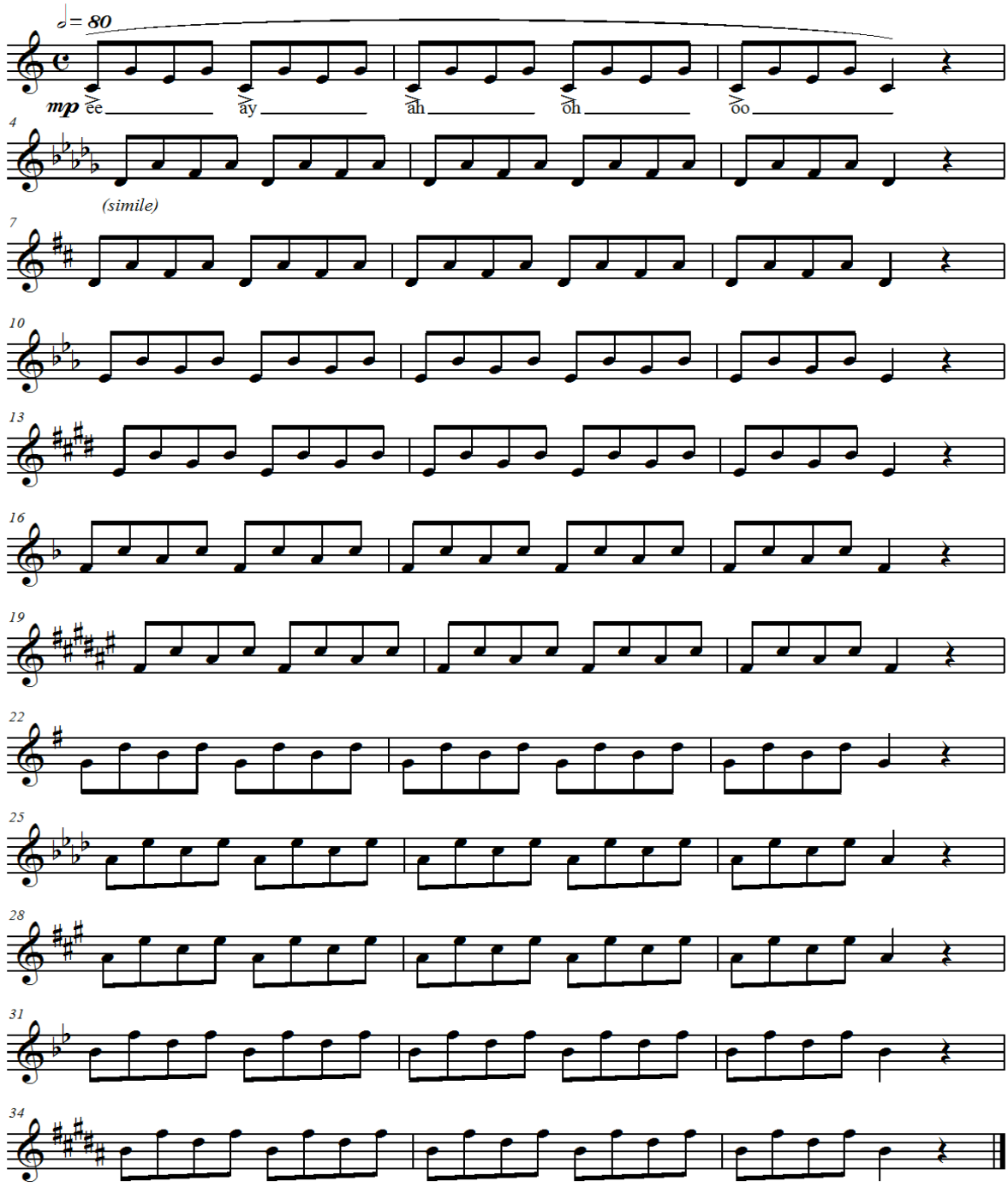


Lower notes heavier.
Follow the same sequences of notes as exercise 3



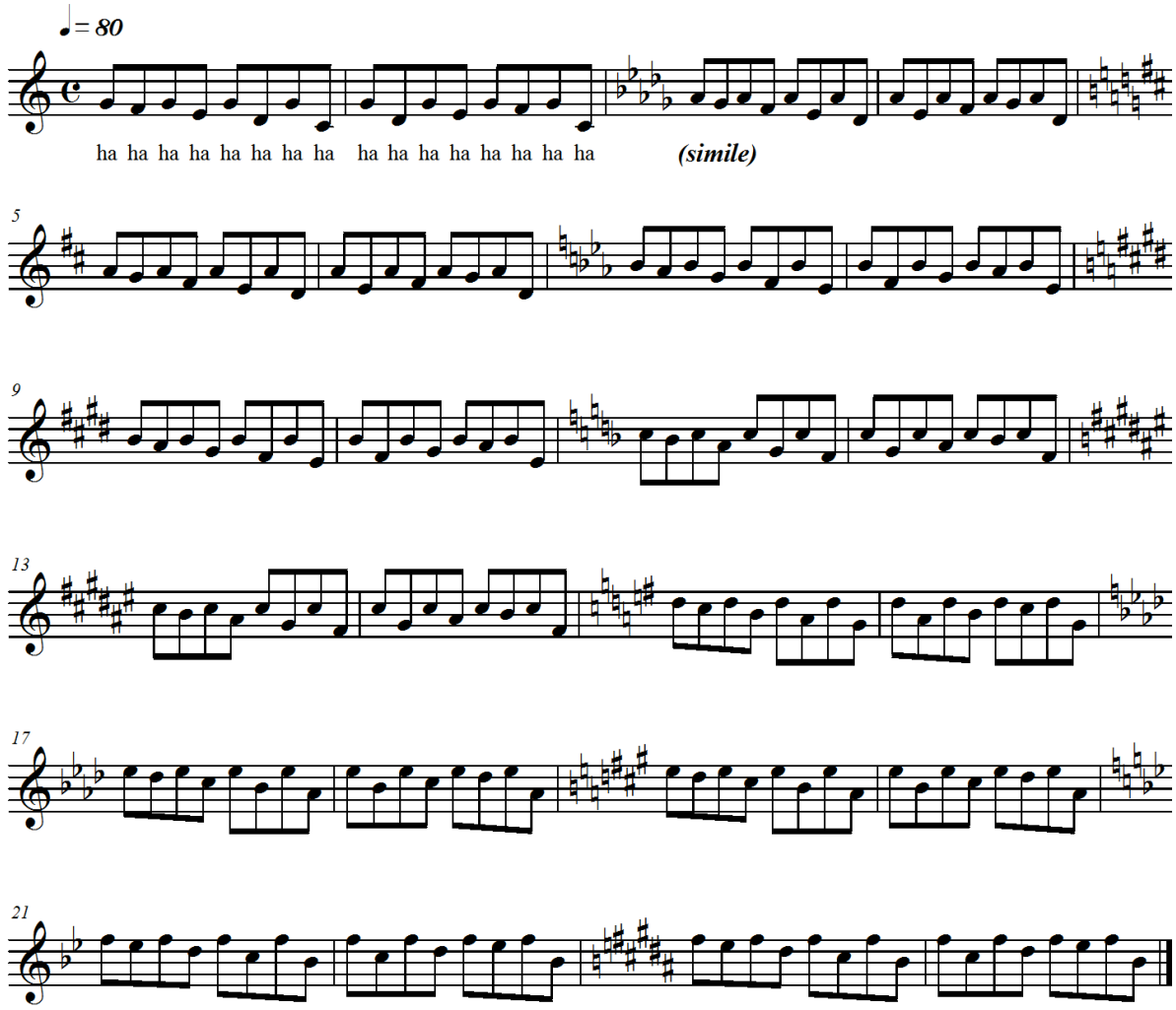
Exercise 8

This exercise should be used for developing vowel flexibility and for working with the resonance.



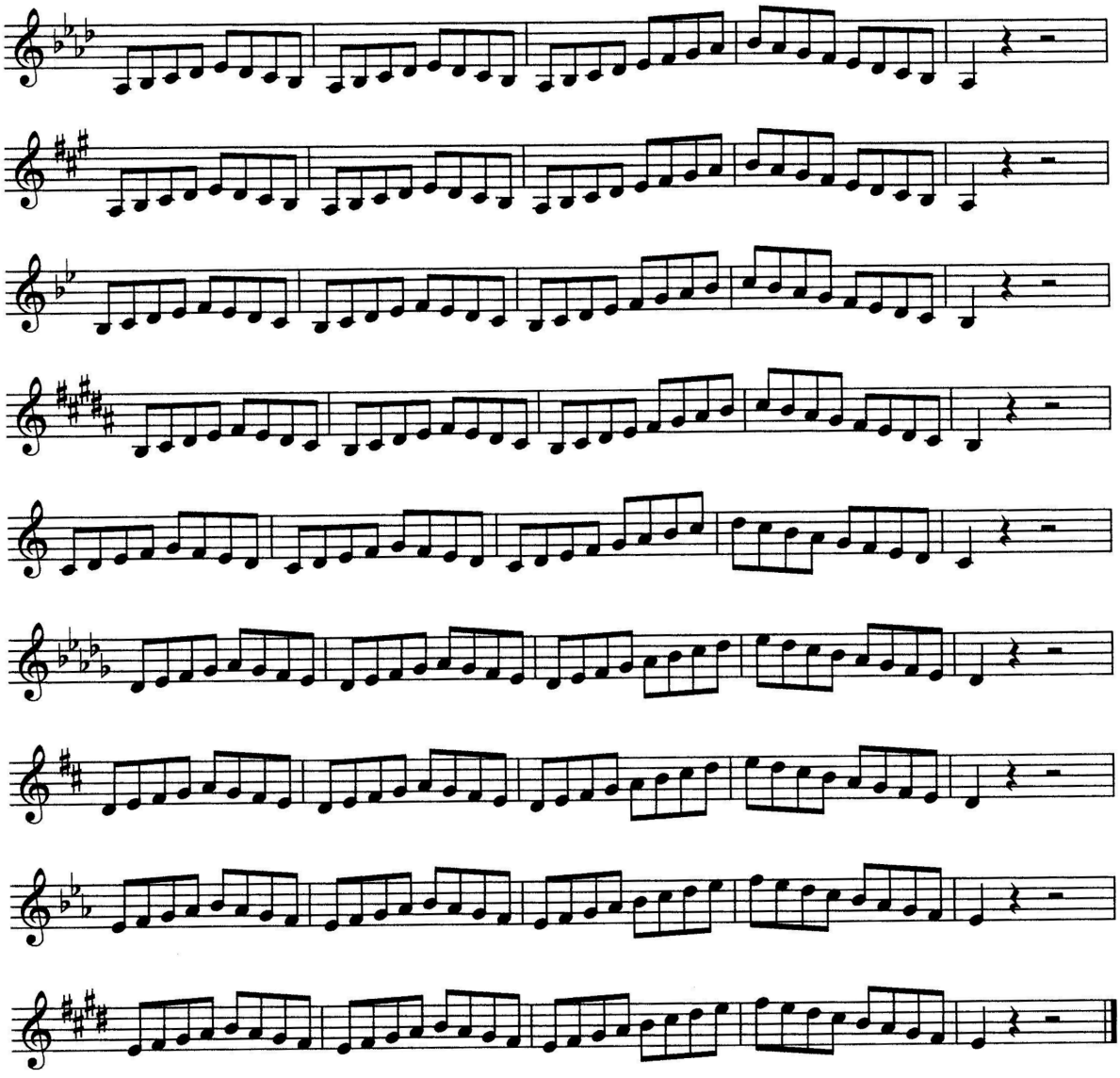
Exercise 9

This exercise is helpful for building the intonation and the flexibility of the resonance cavities. It also focuses on the issue of working with mixed registers; on improving the movement of the breathing muscles and helps developing the lips' flexibility.



Exercise 10

I propose this exercise for improving internal ear, intonation and resonance. It is also helpful for improving the coordination of the air column.



As I mentioned before, I included all these exercises that I presented above in my daily practice routine and after a period of regular practice (about a month), I started to notice real improvement in the quality of my flute tone. In addition, I started to have a different perception of the process of producing a sound. I felt that I was able to aurally experience the involvement of my body in playing the flute. I was feeling more relaxed and I was better controlling all my actions, which allowed me to better fulfill my musical intentions.

After achieving these personal results I was curious to see if other flutist would have the same results with these exercises. In the next chapter, I will describe the experiment that I did, using some of the above exercises with volunteer flute students at different levels of apprenticeship.

Chapter III:

Experimenting with the exercises and the study techniques on different categories of students

In this chapter, I will describe the empirical experiments with some of the proposed exercises. The conclusions of the experiments are based on empirical observation and in some cases in spectrographic sound analysis. I realized these experiments with volunteer flute students. I also discussed the exercises with these volunteers and will quote their opinions when analyzing the results of the experiments.

I chose to experiment with the volunteer flutists exercises number 1, 2, 3 and 6 from the 10 exercises I presented in the second chapter. In order to preserve the flutists' right for privacy, I will refer to them in the text by participant number. However, I mentioned the flutists' names in the acknowledgments section since I was verbally authorized by them to do so.

Experimenting the exercises for breathing

Methodology

In the experiment with the breathing exercises, I used a comparative case study in order to be able to see if the exercises had any significant results. I realized this experiment with four beginner students, whom I am teaching. I divided them in two groups and I realized the experiment over a period of six weeks.

I had one session *per* week with each student. Besides the lessons, the students were told to practice at home the exercises. In every meeting I was empirically comparing and analyzing the results of the impact of the breathing exercises on the students' sound. In the following pages, I will describe this experiment in detail.

Describing the experiment

These exercises were designed for improving the breathing technique, and for giving an alternative way of aurally experimenting the conscious complete breathing. Therefore, I considered that doing the experiment with beginner flute students would give more visible results. As I said above, I divided the students in two groups. Both groups worked two breathing exercises that are most commonly used by flute teachers and are also presented in a large number of flute methods.[1] However, whereas group 1 only worked these exercises, the second practiced my proposed exercises 1 and 2 as well. The exercises that were practiced by both groups consisted of the following:

In the first exercise, the student lies down on the floor with a heavy book on top of the diaphragm area. He has to breathe slowly, watching the book going up, and then let the air go out also very slowly, paying attention to the contractions of the abdominal muscles.

In the second exercise, the student sits on a chair with the hands together, fingers crossed and the elbows touching. Then he presses the elbows to the stomach, leans forward and breathes.

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[1] *La Flute Traversière,* Isabelle Ory,
A Beginner's Practice Book for the Flute, Trevor Wye
A New Tune a Day for Flute, Ned Bennet

After a relatively short period –two to three weeks- and also depending on the age of the students and the amount of regular practice, I started to notice some differences between the two groups in the way they learned the complete breathing. I noticed that the second group of students, who also practiced the breathing exercises from the singing technique, started to gain a considerable advance in improving and mastering the breathing reflexes, compared to the group that only practiced the regular breathing exercises for flute. The participants in the second group were able to breathe faster, in a correct manner, and better coordinate and control the air column.

Presentation of the results

	Week 1	Week 2	Week 3
First Group	*Presenting and starting to practice the exercises	*Verifying the way the students practiced the exercises *Helping them to overcome their difficulties with the exercises	*The students practice correctly the exercises in 30% of the cases. *They can't do the complete breathing. *The students found the process of complete breathing to be very difficult.
Second Group	*Presenting and starting to practice the exercises	*Verifying the way the students practiced the exercises *Helping them to overcome their difficulties with the exercises	*The students practice correctly the breathing exercises from the singing technique in 50% of the cases. *They practiced correctly the regular breathing exercises in 30% of the cases. *The students can't do the complete breathing

	Week 4	Week 5	Week 6
First Group	*The students practice correctly the exercises in 40% of the cases. *They are able to do the complete breathing by itself only in 20% of the cases.	*The students practice very correctly the breathing exercises in 50% of the cases. *They can do the complete breathing by itself in 40% of the cases.	*The students practice very correctly the breathing exercises in 60% of the cases, but only in 50 % of the cases they can't do the complete breathing.
Second Group	*The students practice correctly all the exercises in 60% of the cases and they can make the complete breathing in 40% of the cases.	*The students practice very correctly the breathing exercises in 70% of the cases. *They can do the complete breathing while playing flute, in 60% of the cases.	*The students practice very correctly the breathing exercises in 80% of the cases, but only in 70 % of the cases they can do the complete breathing.

Analysis of the results

From the above presentation, I believe that the positive impact these *new* breathing exercises had on the beginner flute students is obvious. They were able to do the complete breathing in a shorter period of time and with better results than the students that only did the normal breathing exercises. After four weeks of practice with the exercises the second group of students - which did also the *new* breathing exercises -, was able to do the complete breathing in 40% of the cases, while the first group – who only did the regular breathing exercises -, was able to do the complete breathing only in 20% of the cases. By the end of the experiment, the second group improved their breathing in a larger percent than the first group. After six weeks, the second group was able to do the complete

breathing in 70% of the cases, while the first group was only able to do the complete breathing in 50% of the cases.

There is yet another important aspect that I noticed during this experiment: the *new* breathing exercises were better understood and assimilated than the regular breathing exercises. After three weeks of practice, both groups of students were correctly doing the regular breathing exercises in only 30% percent of the cases. At the same time, the second was doing correctly the *new* breathing exercises in 50% of the cases. This difference maintained along the experiment, as far as in the last week of the experiment, when the regular breathing exercises were correctly practiced only in 60% of the cases, while the *new* breathing exercises were correctly practiced in 80% of the cases. Because of these facts, I tend to believe that the *new* breathing exercises are much easier to practice and can be much easier understood than the regular breathing exercises.

Conclusion

My conclusion after experimenting with these two *new* breathing exercises is that they were more effective at forming the reflexes for a correct breathing and good control of the air column than the exercises proposed by the most used method books for flute beginners. Also, the participants reacted more naturally and spontaneously to the two *new* exercises, by being able to perform the complete breathing in a much easier way, and with less effort than the participants who only worked the regular breathing exercises.

After experimenting these two exercises on me and after testing them on volunteer students as well, I should say that they yield an aural approach of the complete breathing. I think that this is the

reason why the students had a more positive reaction when learning the complete breathing. I also noticed on me while doing these exercises that it was possible to have a better perception of the breathing muscles' movement. I may say that while doing the experiment with the students, I realized that these exercises also helped them becoming aware of the breathing muscles' movement. Therefore, the students were able to better control their muscles and to attain muscular independence by doing these exercises, which made possible the achievement of complete breathing.

Experimenting the exercises for tone development

Methodology

I experimented exercises 3 and 6 with six volunteer flute students of medium and advanced level. I did an individual session with each student where I experimented these exercises. I recorded the experiment for an eventual sound analysis of the student playing the exercises.

I only did one session with each student because I was interested to see the first impact and the effects these exercises had/had not on the students. Below, I will describe the experiment with each student. I found necessary to explain each experiment individually because the exercises had a different impact on the participants, and also because each student was a different case in itself.

Describing the experiment

As I explained in the second chapter, the exercises for tone development have three phases. In the first phase, the student sings the exercise with the mouth closed, humming. The aim of this is to make the student feel the sensation of vibration inside the resonating cavities, in order to become aware of the way the vocal tract shapes for singing the notes in tune, and for maintaining a relaxed and open throat. The student can only pass to the next phase after becoming aware of the described sensations. In the second phase, the student sings the exercise with the mouth open, trying to maintain the same sensations he/she experienced in the first phase. This phase was a bit difficult for the students that were not used to sing in a correct way.

Sometimes it took a little more time to achieve good results, and it was useful to go back to the first phase, in order to make them feel the sensations again. Only after this second phase is correctly performed, I explained the student how to proceed in the third and the last phase. In this last step, the student plays the exercise with the flute maintaining the same sensations as in the first and second phase.

The aim of the exercises

Exercise 3 from the previous chapter has the goal of making the flutist feel the sensation of resonance in the nasal cavity and have an "open throat" position. The second exercise I experimented with the six participants is Exercise 6. When I experimented Exercise 6 on me, I found that it was helpful for improving the intonation, because it mixes different intervals in the range of an octave and also develops the internal ear. I also found helpful for developing the sensation of resonance in the vocal tract, and good for mixing the registers (passing from a register to another became much easier).

Describing the work with the students

Working with participant 1

When doing the exercise 3 with participant 1 I noticed that he was firstly having problems in singing in tune and, secondly, he was singing and playing with some tension in the throat. This was making it difficult for him to achieve a good resonance when singing and a good quality of the tone when playing. He was conscious that he had

intonation problems, but he was not aware of the tension he was putting on the throat.

Initially, I started working towards solving the intonation problem by telling him to do the exercise very slowly, so that he could have time to hear the sound first in his mind and then singing it. I realized that his internal ear was still in an undeveloped stage and that he needed to practice more for solving this problem. Initially, he had difficulties in singing the correct pitch but after some time of doing the exercise he was able to find the pitch much faster. This also influenced his intonation while playing the flute, and now he has a better and more precise intonation.

Next, I tried to solve the problem of the tense throat. The student was not even conscious of this issue. I started explaining him that he should play trying to keep the larynx in the most relaxed position. Nevertheless, playing with a tense larynx was the way it should be for him and it was not possible to make him realize how tense his larynx was when he was playing.

For him to be aware of what he was doing wrong, I told him to sing the exercise focusing on feeling the sensation of resonance in the vocal tract, using a relaxed position of the throat as much as possible. When explaining him all these things, I used many of the suggestions that I heard in the singing classes, as for example “try to emit the sound having the same sensation as for yawning” and other ways that could give him an image of a relaxed throat. After singing the exercise many times like this, he started being aware of almost all the sensations that he was experiencing when singing, and, most important for that moment, the sensation of how it feels to sing with a relaxed larynx.

Afterwards, I told him to transport that sensation into playing the flute. I told him that he should prepare his body to sing. However, instead of producing the sound with the vocal cords, he should produce the sound with the lips into the flute. It worked like magic and he looked at me amazed and happy with the fact that he could do it and that he had understood what means to play with a relaxed position of the larynx.

That was the first step in correcting the tense larynx. I told him afterwards that, from now on, he should try to do this correction exercise regularly, in order to assure the implementation of this newly achieved result. It was a very difficult process and it took a long time to implement. I could not proceed in my study using the vocal resonators for increasing the resonance of the flute sound, as this next step requires the reflex of singing and playing the flute with a relaxed position of the larynx. However, I could see that the singing techniques can give visible results for achieving a relaxed position of the larynx and by that improving the flute playing, and that was my goal.

When doing the Exercise 6 with the same participant I tried to continue the work from the last exercise. Now when doing this exercise, he was becoming more secure on the intonation and he was all the time careful to maintain a relaxed position of the larynx.

Exercise 6 is a little more complex than exercise 3 as it has more intervals and is extends over a larger register. The student found this exercise a bit more difficult than the third and his tension in the throat was becoming more noticeable. Now he was having moments when he played very tense, especially when he was passing from one register to another, together with moments when he could

control his tension and fight it. When he was playing in a relaxed manner, he was able to feel the sensation of resonance in the vocal tract and we could also hear the difference in the quality of his tone.

Working with participant number 2

Doing exercise 3 with participant number 2 was less problematical than with the first participant. Participant number 2 had initially some problems in singing at the right pitch, but that was motivated by the lack of practice in the coordination between the voice and the internal ear. After some short training, the participant was singing perfectly in tune. This participant was playing and singing with a relaxed position of the larynx. Now I had the opportunity to experiment the use of vocal resonators. First, I explained the participant that he should sing the exercise, trying to feel the sound vibrating in the resonating cavities — the oral cavity and nasal cavities. For a better conceptualization and visualization in the process of using the resonating areas, I showed the participant the picture of the vocal tract that was presented in the previous chapter. I also told him that he should pay attention to the space created inside his vocal tract when singing, because he will have to be able to create the same space again but without singing.

After some practice with the first stage of the exercise and when the participant told me that he could feel the sensation of the sound vibrating in the vocal tract, I passed to the second stage of the exercise. When the second stage was completed, I passed to the last stage of the exercise. Initially, he found a little difficult to perform the exercise as I told him, but after a few tries he was able to do it correctly. When he was doing it in the correct manner, I could hear a

difference in the tone comparing to the tone he produced when he first played that exercise.

After completing Exercise 3 we passed to Exercise 6, which was a little more complex as it was introducing bigger intervals and expanding the range. The participant did not encountered big difficulties when working on the exercise, but he was having some little hesitations when moving between the registers, especially when he had to go into the high register. I then told him to sing the exercise very slowly and try to focus on hearing the notes internally before emitting the sound. When he sang those passages without any problem, I asked him to play them with the flute. Now the sound appeared to be more focused, more consistent and with no hesitation. Initially, this participant was not fully aware of how much air he should use, at what speed and how to direct it. Moreover, he was doing too much pressure on the lips in the high register and that was perturbing the tone. However, after singing correctly the exercise, his internal ear took the control and it was coordinating everything perfectly.

I also asked the student his opinion, if he was noticing some changes in the way he was playing. The student's opinion was that now he was feeling it had become easier to control the air column, the direction, the quantity and the speed, after practicing the exercise with the voice. The participant also noticed that his sound had gained more body and it had become more consistent.

Working with participant number 3

Participant number 3 is a beginner student a bit more advanced than the others are. He had some problems in controlling the breathing, and these were making it difficult for him to play in a relaxed manner. He was feeling insecure in coordinating the air column and he was looking for alternative ways of understanding the process of the air coordination and control and ways to improve the flute tone. First, I analyzed if he was breathing correctly and noticed that his breathing reflexes were good but he was not fully conscious of how he should direct the air column, and how much speed and air quantity should he use.

During the first stage of the exercise, I noticed that he had a very good coordination between the internal ear and the voice. This important aspect allowed me to work faster in solving the other problems. He was singing correctly and, as a response to the internal ear command, all the muscles were working in perfect coordination, including the muscles involved in the breathing process. I asked him to pay attention to his breathing coordination when he was singing. I also explained him how he should sing in order to feel the sensation of vibration in the resonating cavities. After accomplishing this stage, the next step was easy to do, and he quickly realized how he should control and adjust his breathing and resonating spaces. Having all this in mind, it was relatively simple to implement the same manner of breathing and resonating space coordination in the last stage. When he finally managed to play the exercise in the same way he was singing it I could noticed that the tone had become more focused and round, and it had improved in texture (it was more consistent now) and in projection. In his opinion, the exercise helped him to solve the

breathing coordination problem and helped him to improve the sound production and tone; it was now more secure and he was feeling more comfortable in playing in all the registers.

When doing exercise 6 with this participant I tried to focus even more in using the resonating spaces and improving the flexibility. The participant said that he was already feeling more comfortable and flexible in controlling the air column after doing exercise 3 and that he really enjoyed using the resonating cavities and singing. He told me that he was really surprised by the fact that now he does not have to do so much effort for coordinating the air column and for reaching a more compact and penetrating tone. I could notice the difference in the tone with which he was playing in the beginning of the experiment and see the transformation on his sound throughout the experiment. In the beginning, the tone was poor, it had no harmonics, and it was somehow insecure. Progressively, the sound gained in harmonics and it was becoming more stable.

Working with participant number 4

Participant number four was similar to the third participant. He was beginner at a little more advanced level, he had difficulties in air coordination and he was encountering difficulties in achieving a good tone quality because it was not very clear for him the way he could improve his sound. Nevertheless, there was an important difference between the two, the internal ear of the fourth participant was very poor and he had big problems in singing in tune. He could only sing if I was playing for him the notes on the piano, and, even so, he was most part of the time out of tune. I had to work in the first two stages very slowly on the improvement of the internal ear by insisting many

times that he played the same note. Surprisingly, when reaching the last stage the exercise, I could notice a big improvement in the tone quality. Now the tone was more secure without so many hesitations as before applying the singing techniques. The student told me that now he discovered what means to play flute using the space inside the vocal tract, a thing that his teacher was telling him very often but he could not realize what the teacher meant by that.

The problems of internal ear and intonation of participant number 4 become even more evident while doing exercise 6: he could not sing the whole exercise with a good intonation even if I was giving him the tone for the beginning note. I had to focus more time in resolving this problem, as this exercise was more complex than the exercise 3. However, I was convinced that once this problem was solved, he would give a big step in improving the tone quality. I experienced that with him when doing the exercise 3. When the two stages were completed, I asked him to play the exercise with the flute.

During the final step of the experiment with exercise 6, I noticed some transformation in his tone. I noticed that he had more flexibility and facility in playing larger intervals and he became more secure when jumping from one register to another. When I asked for his opinion about the exercises and about using the singing techniques, he told me that he found this method very helpful in clarifying and solving many problems that he had, and that he found this approach to be an alternative and much clear answer to his doubts. Before working with these exercises, he was feeling insecure of how he should coordinate the air column and how he should shape the vocal tract in order to achieve a good quality tone.

Working with participant number 5

Participant number 5 is an advanced level student. When experimenting exercises 3 and 6 with this participant, I encountered a very similar trajectory of development and similar conclusions as when doing the experiment with participant number 2. The participant was satisfied with the results and told me that he felt this way of practice helped him in achieving faster improvements of the flute tone.

Working with participant number 6

The last participant in the experiment was a very different case. He was at a superior level of development and he had in general a good tone. When doing the first two stages I did not see any intonation problems as he could find the pitches very easily. For him, it was difficult to direct the sound to the resonation spaces. I explained him in various ways how he should direct the air column and how to shape the resonance cavities by moving the tong, the jaw and the soft palate. I had to spend a lot of time doing singing exercises with him. He told me that he never sings and now he had discovered so many new sensations that he needed more time to get used to it and to become conscious of all the factors. After he felt more secure with the singing I passed to the last stage of playing the exercise. The results I was aiming for were starting to appear slowly but steadily. I could notice small improvements in the tone as it was more compact and with a better projection.

I was very curious to see how he would react when experimenting exercise 6, because it was more complex then the previous exercise and for him this would represent a bigger

challenge. As in the previous experience with the exercise 3, he had little problems in singing the exercises in tune, but he was not yet secure in visualizing how his vocal mechanism worked. I also showed him the picture of the vocal tract and explained him more about professional singing. He was able to give important steps in developing his singing voice and habits with the help of his good ear and his musical intuition. However, the improvements in the sound were not so obvious when compared with other students, but I think that with regular singing practice he would be able to reach a higher development of his tone. He had a good opinion about this kind of practice, and he found it interesting as an alternative way of developing the flexibility, the clarity, the projection and the color of the tone.

Conclusions

As a conclusion to this empirical observation, I find the results rather encouraging for implementing this method of practice and this kind of exercises as a long-term method of practice. The opinion of the students was very positive; all of them said that they felt the exercises really helpful in improving the tone quality. The general opinion was that these exercises were helpful in attaining a richer tone, with more harmonics and more tone colors. Moreover, the exercises helped improving the intonation by developing the internal ear, the coordination of the air column, the projection, and the flexibility of the tone.

In my opinion, these exercises made an aural perception of the phenomenon of producing a tone possible. By previously singing, the flutists had the opportunity to develop the internal ear, to feel the

sensation of producing a sound inside their body. I thus believe that it is possible a better control of the tone and a wider array of tone characteristics by applying the methodology proposed in this study.

Another important conclusion of the experiment was the fact that through singing the students had the opportunity to experiment with the sensation of producing a sound with a relaxed position of the throat. This aspect was of real value for the flute players that had difficulties in maintaining an *open throat* position while playing, and in the end of the experiment they were able to attain a more relaxed position of the larynx.

Applying spectral analysis to the experiments

Another method I used for observing the results of the experiences was recording the exercises and then doing spectral analyses for the cases where I previously noticed some differences in the tone quality. From the experiences described above, the only participant I found appropriate for spectral analysis was participant number 2. He was the only one that was able to use the vocal resonators, at a relatively noticeable level. In order to have a comparison term, I also did a spectral analysis of the exercise played by the participant before introducing him to the singing technique. The following analyses are from parts of the Exercise 3.

In Figures 4 and 6, the participant plays Exercise 3 without applying singing techniques and in Figures 5 and 7 he plays the same exercise on the same note and register respectively, this time applying the singing techniques. From an empirical point of view, I can say that the spectral analysis shows that the tone became clearer, without so many “blurs”. Moreover, the partials of the sound have a

higher definition and the reinforcement of the lower partials of the sound is noticeable. I believe that the reinforcement of the lower partials is due to shaping the vocal resonators for playing as if for singing. Vennard (1967, Chapter 1) found that the first harmonic is very powerful in the voice spectrum. This spectral analysis confirms that the flute tone benefits form the sympathetic resonance of the vocal tract. It is, of course, necessary to previously introduce the flutist to the singing techniques, and teach him/her to apply these techniques in a correct manner. Only this way the flute tone may gain in resonance and quality, will become clearer with more colors, flexible, and with a sharper definition.

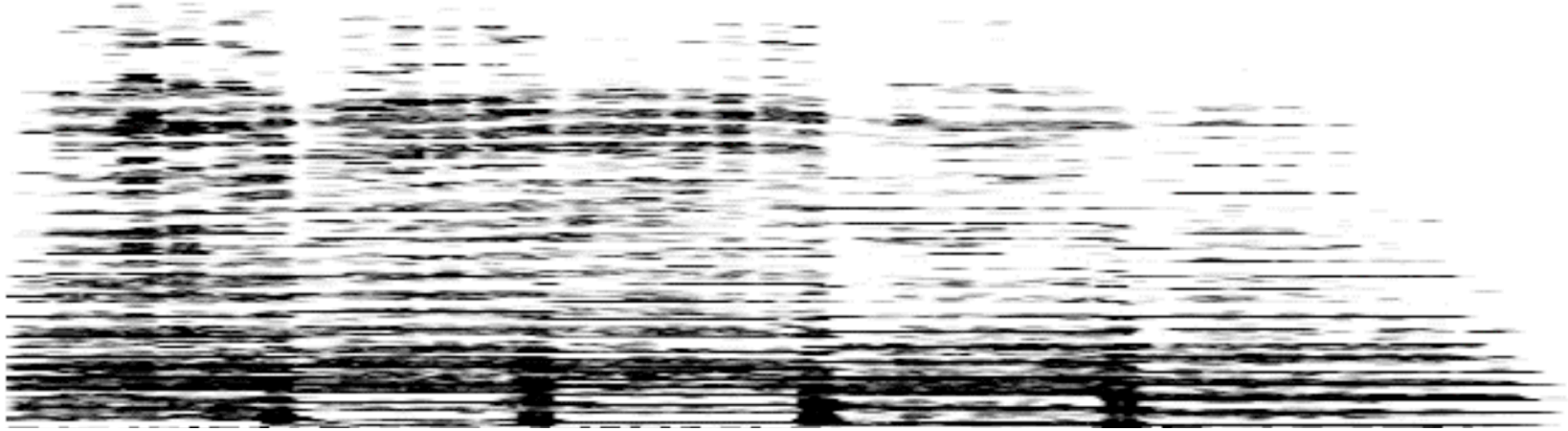

Figure 4 Participant number 2 playing the Exercise 3 in A flat Major in the middle register, before singing the exercise

Figure 5 Participant number 2 playing the Exercise 3 in A flat Major in the middle register, after singing the exercise

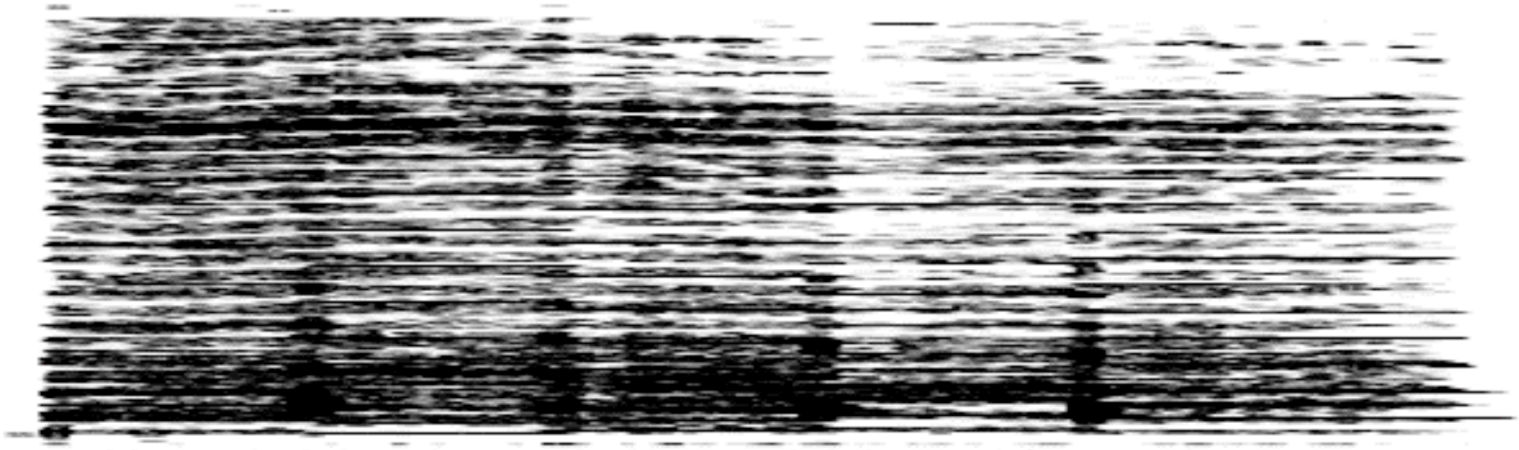

Figure 6 Participant number 2 playing the Exercise 3 in A flat Major in the high register, before singing the exercise

Figure 7 Participant number 2 playing the Exercise 3 in A flat Major in the high register, after singing the exercise

Chapter IV:

Reflexive study: Applying the proposed techniques in developing a recital program.

The positive results of my empirical investigation using singing techniques led me to apply these new possibilities to my own flute practice.

As I mentioned in Chapter I, some flute methods propose singing for improving the flute tone. By studying these methods, and practicing the exercises related to singing, I felt these were helpful for improving my tone. Therefore, I wanted to know more about how singing could help overcome the problems in flute playing at an advanced level.

In the next pages, I will explain how I have practiced my repertoire and how I solved difficult passages by using elements from the singing techniques. In a reflexive case study, I am going to describe my experience of applying these singing techniques when approaching two different pieces, from two very different styles, the "Introduction und Variationen über *Trockne Blumen,"* op. 160 by Frantz Schubert and the "Partita in A minor" for flute, (BWV 1013) by Johan Sebastian Bach.

I. Method of practice used for "Introduction und Variationen über Trockne Blumen*," op. 160 by Frantz Schubert*

"Introduction und Variationen über *Trockne Blumen"* was chosen because this piece is inspired by a *lied* that Shubert himself composed, and I see it as an example of how the flute may be considered as equivalent of the voice. Having this in mind, I imagined that this piece would be most adequate for me to discover how I could "sing with the flute". This piece, the one and only work for flute in Shubert's music, was written in January 1824, and dedicated to his friend, the flute player, Ferdinand Bogner.

My other chosen piece is the "Partita in A minor" for flute, (BWV 1013) by Johan Sebastian Bach. I opted for this piece because I suspected that using elements from the singing technique could help in developing a more faithful approach to the baroque style. This piece, like all of Bach's compositions, has a very complex structure. This is the reason why a good interpretation of it represents a challenge for every flutist — it does not matter how skilled or how many times a flutist has played it.

When studying the *Introduction und Variationen,* I tried to solve the technical problems related to breathing and tone quality using the newfound alternative methods taken from singing. By breathing problems, I am referring to the three phases of the breathing process[1] and to the control and coordination of the air column. By tone quality, I am referring to the aspects of intonation, dynamic, and timbre colors.

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[1] See Chapter 2, introduction part of breathing exercises.

Solving the breathing problems

For solving the problems related to the breathing process, I used the breathing exercises that I presented in the second chapter - Exercise 1 and 2. More specifically I used the breathing method from Exercise 1, in the places where the inspiration has to be very fast. There are moments in the piece where a quick but effective inspiration, inhaling a large amount of air, is required. For example:

In the *Introduktion,* even though the movement is relatively slow - it has the indication of *Andante* - there are places were I felt it was necessary to do a quick inspiration and inhale a great quantity of air. For an clearer understanding, I have marked the places with a breathing sign (Example 1)

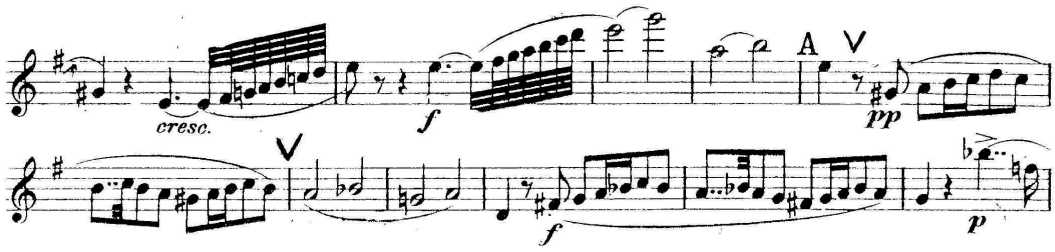


Figure 8 Example 1

In the *Thema*, which is a little bit faster in movement, the indication is *Andantino* and there is a place where I considered that a quick inspiration is needed. This is more of a style inspiration than a physically needed one. This part, *Theme,* is a quotation of the lied *Trockne Blumen,* the eighteenth lied of the cycle *Die schöne Müllerin.* The story of this lied is a sad story: the flowers that the miller's daughter gave to the hero of the story started to fade and he sees this as a sign announcing that her love for him will also fade. Therefore, the music expresses all these sad feelings of interior grief and suffering that the hero feels; the music is like a mourn for the loss of her love.

The use of fast breathing helps create the image of someone breathing with sorrow and pain. While hearing the lied I noticed that the singer's breathing was also very fast and that the emotion he was conveying was of deep regret and unhappiness. I imagined that utilizing the same kind of breathing the singer used would be helpful for punctuating the phrase. In addition, I tried to create the sensation of a sigh when articulating. In the example below, I marked the breathing with a breathing sign and the sigh kind-of articulation with a circle (Example 2)

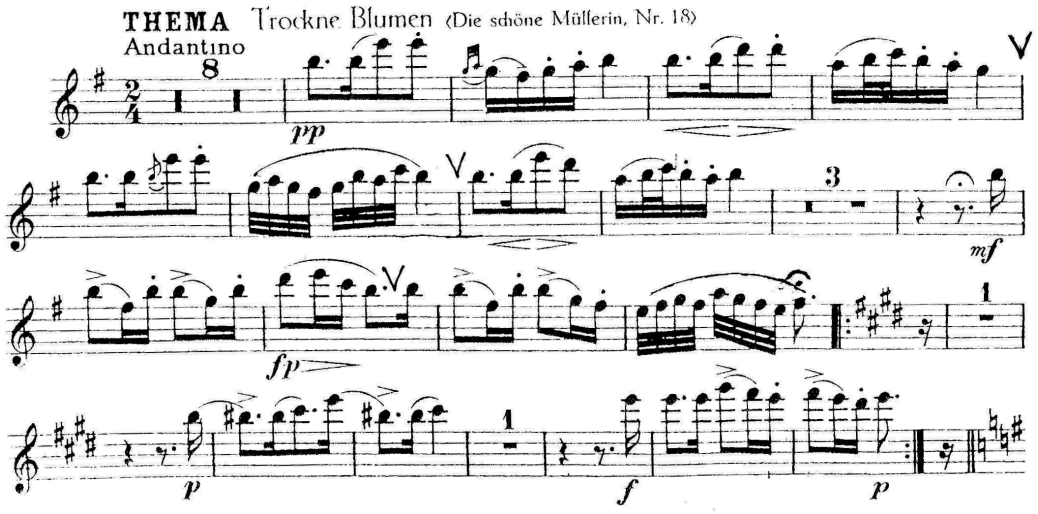


Figure 9 Example 2

In Variation *1,* I also encountered some places where fast breathing was needed. The breathing in the example above is a stylistically kind-of breathing as well as a physically needed one. It is a style breathing because as it creates the image of grief. (Example 3)

Figure 10 Example 3

In the next example, the breathing is physically required. The movement of the music is very fast, and there are no other places where one can take a long breath. (Example 4)

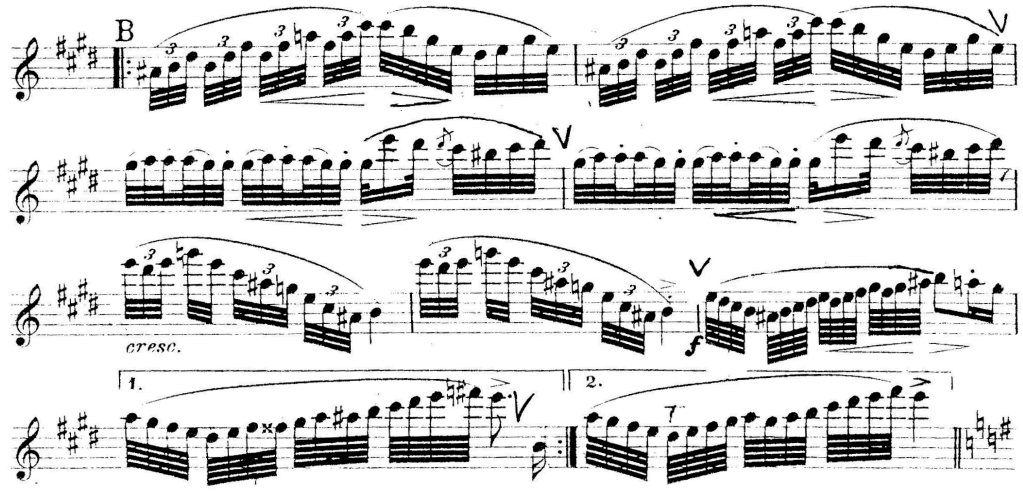


Figure 11 Example 4

The next place where I felt necessary to use the fast breathing was in Variation *4.* Similar to the previous example, there were no places where one could take a normal breath and a fast breathing was necessary (Example 5).

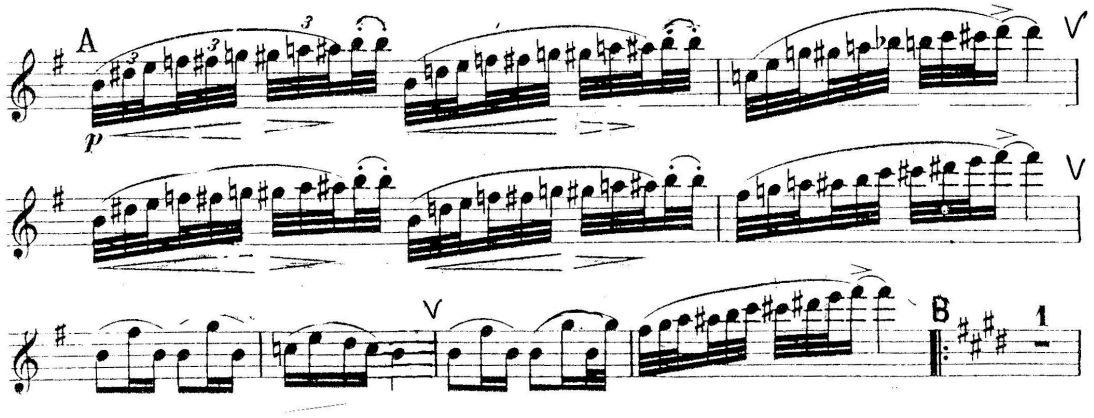
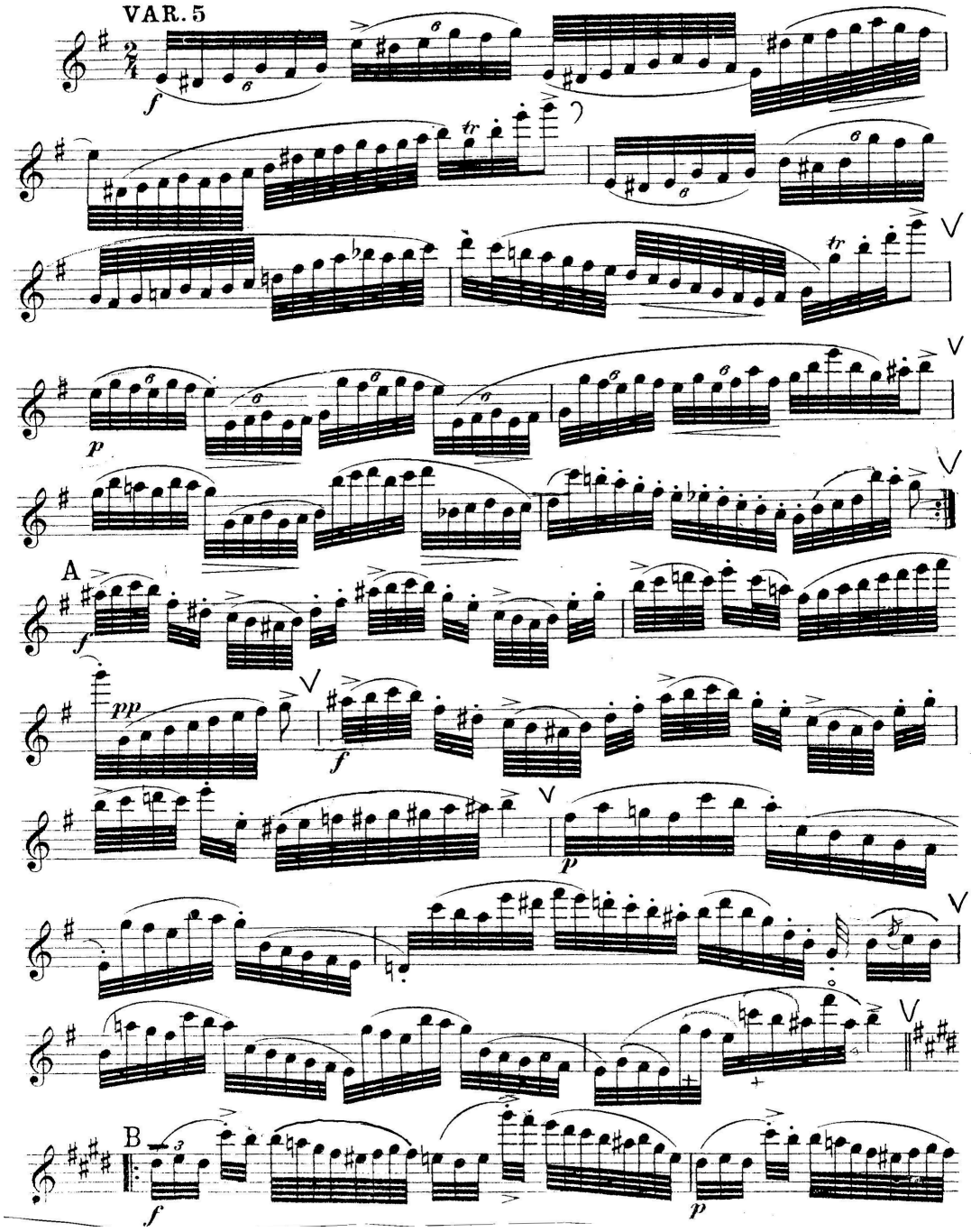


Figure 12 Examples 5

The place in the whole piece where a good habit of quick inspiration is of crucial importance is in Variation 5 (Example 6).



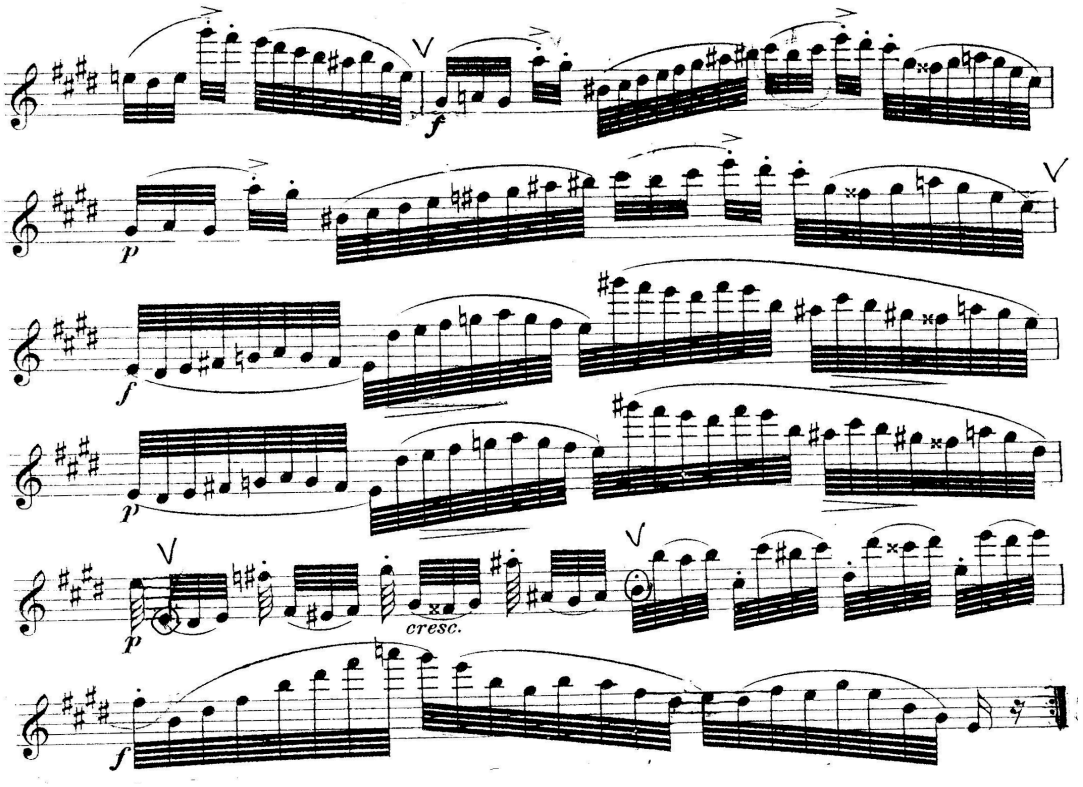


Figure 13 Example 6

Variation *6* represents a moment of rest for the flutist after the tumultuous movement of the Variation *5*. Even so, in the last bars of this part, a fast breathing is needed. This is because the last bars are announcing the fast movement of the final Variation *7* (Example 7)

Figure 14 Example 7

The problems related to the breathing support that I encountered when practicing the *Introduction und Variationen*, were also solved by using various methods of practice that I got from the singing classes. I used Exercise 2 from the breathing exercises in my

daily practice routine for some time. I found it very useful for improving the breath support, which represents a very important aspect for achieving a good tone quality, an accurate intonation, and for the desired type of dynamics and timbre colors. I can say that I apply this kind of sustained breathing in everything that I play.

Solving tone-related problems

In order to eliminate any problems of intonation that may appear, I worked the following way:

1. I sang the whole piece in my voice register (when necessary, I transposed the extreme range notes to the register where I was comfortable);
2. I insisted in the passages where I noticed that my intonation was out of tune, or in places where the intervals were more difficult for me.

By singing the piece, I trained my internal ear. This way, when playing the piece, my internal ear would be able to give the commands for the correct air coordination and embouchure shifting. This phase of practice represented a very long and demanding process, as it needed high concentration in order to obtain good quality results.

Moreover, the process of singing the piece helped me also improve the tone quality. This is because when I was singing, I tried to feel the sound vibrating in the resonance cavities by shifting the vocal tract, as I felt necessary. In other words: if a resonating space is shaped in a specific manner, it will have a particular favorable frequency and as a result, it will reinforce the partials in the tone that matches to its frequency.

In order to find the better position for the resonance spaces I tried out all the vowels. I sang each passage changing the vowels, and concentrating on sensing which way I was feeling the most vibrations in the vocal tract. I have to mention that this kind of work had not been possible without a previous training in singing.

The reason for trying out all the vowels is that each vowel has different formants. These particular formants affect the tone color of the flute. The vowel formants are points of energy accumulated in determinate zone frequencies of the sound wave, also called *fixed formants*. As a logical conclusion "If a vowel is formed in a particular way and in a particular form it has a specific frequency, vowels have pitch. The resonators are shaped by what vowel is being sung" (Docher, 1994, p. 134-135). These aspects are of real value in my study, because they support my argument that, *shaping the vocal tract as if for singing modifies the spectrum of the flute sound*.

The next step is to prove that shaping the resonators when playing, as when singing certain vowels, also influences the spectrum of the flute sound. The next statement gives reasons to believe that I am on the right path: "vowel formants are an acoustical fact and must be observed if the singing voice is to be efficiently tuned and optimum sympathetic resonance" (p. 139).

Additionally, I did an experiment using myself on singing certain vowels. The experiment consisted of first singing a vowel, on a certain note, with a good resonance and then playing the flute shaping the resonators as if for singing that vowel. The result was a noticeable difference in the flute tone. In order to have an even more conclusive result, I did a spectral analyze of the experiment. The

results are satisfactory and I believe that the following spectrograms speak for themselves. See Figures 15, 16 and 17:

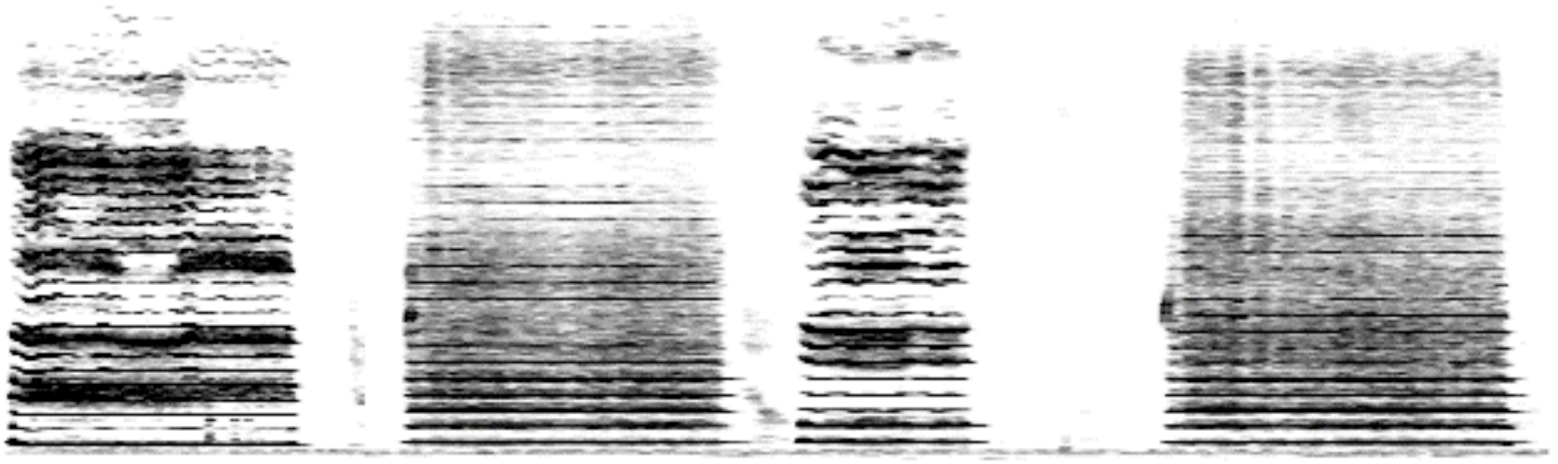


Figure 15 Singing and playing the vowel *a* and then the vowel *e*

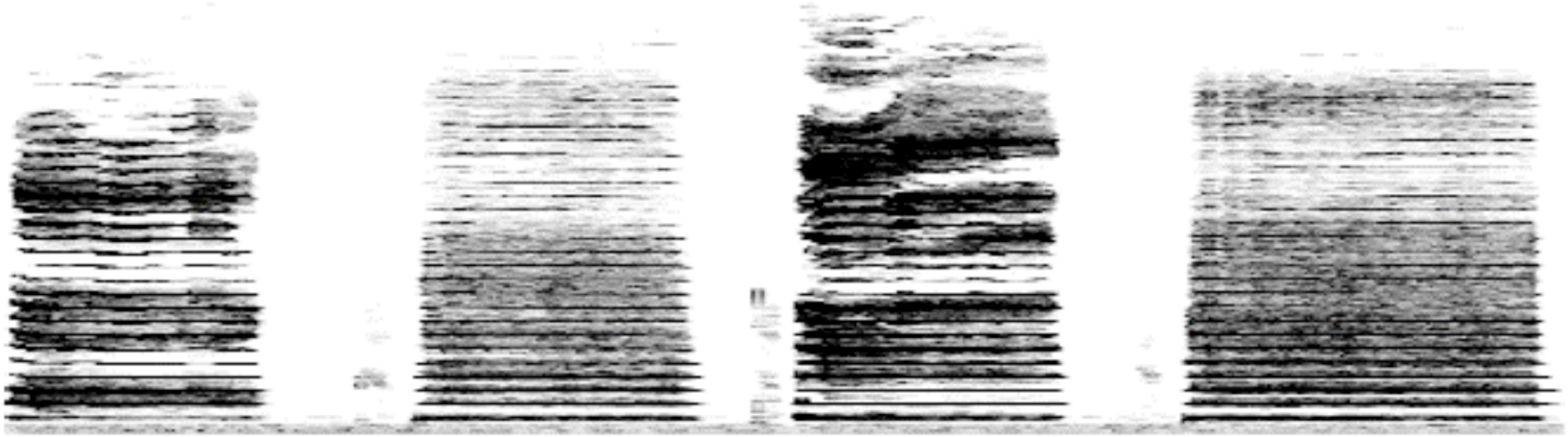


Figure 16 Singing and playing the vowel *i* and then the vowel *o*

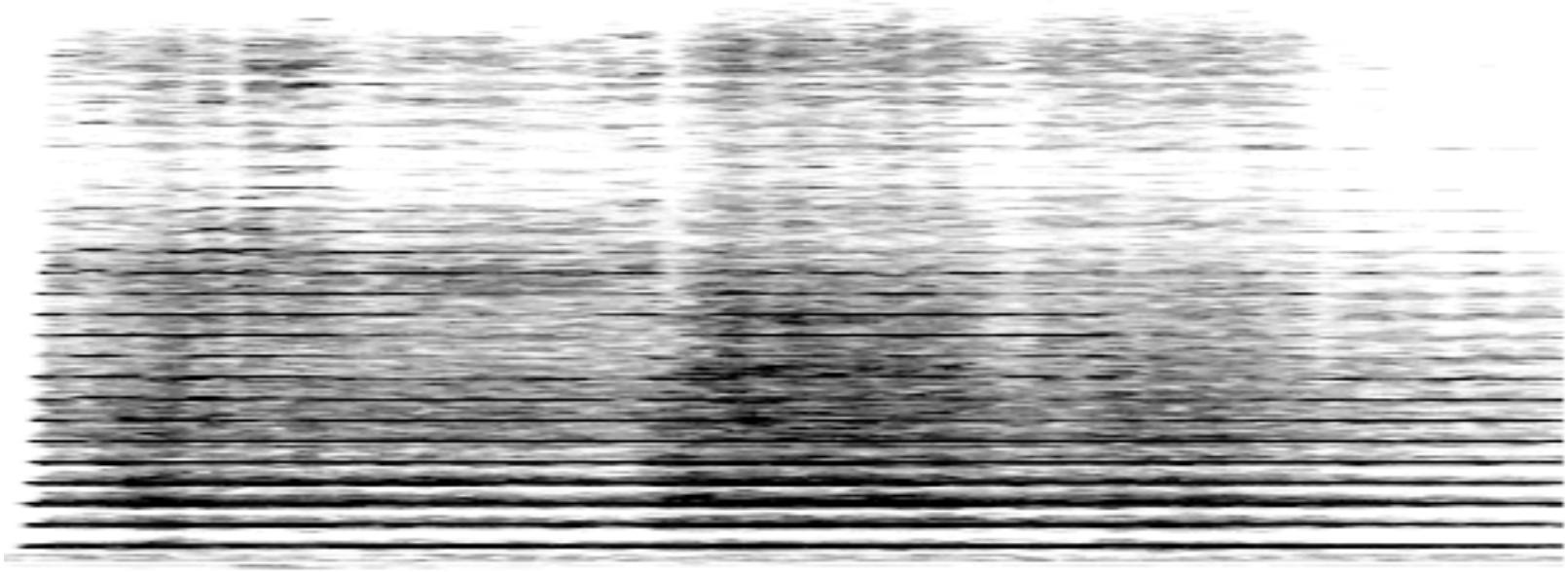


Figure 17 Playing with the vowels *a, e, i, o, u*.

In the above spectrograms, the influence of the vowel formants in the flute tone is obvious. The vowel formants can be distinguished in the spectrograms of the flute tone, which demonstrates the existence of the sympathetic resonance of the vocal tract when playing flute. The specific formants of each vowel alter the positions of the partials of flute tone, thereby changing the characteristics of the timbre. Thus this serves my argument that *shaping the vocal tract as if for singing modifies the spectrum of the flute sound*. When one looks closely at these spectral analyses, it becomes very clear the fact that different vowels can be used for changing the color of the flute tone.

Another problem that I tried to solve by using singing before flute playing is dynamics. In my opinion, this was a very simple aspect to work out. Singing before playing, automatically coordinates the air column and the breathing support, as shown earlier. Furthermore, if one is using the vowels that allow the best resonance or, on the contrary, using "weaker" vowels for the notes to be played, than the sound will gain or lose in power. Subsequently, by singing with the desired dynamics the brain will memorize the actions and when the same passage will be played, the feedback will automatically react by controlling the muscles (breathing muscles), and adjust the shape of the resonators (the pharynx, the tongue, the palate an the jaw).

Working in the described manner proved to be very helpful for solving the breathing and the tone related problems. Singing proved to have a positive impact on the tone quality. I noticed that when using the vocal resonators while playing flute, the tone changes and seem to become richer and fuller. Moreover, singing proves to be a

valuable help for playing in tune, and for coordinating the air column as it creates a feedback for the internal ear and for the respiratory muscles.

In the next pages I will describe the experimentation of the singing-based practice method for the Bach's Partita. The working strategy was basically the same as for the Schubert's Variations.

II. Method of practice used for "Partita in A minor" for flute, (BWV 1013) by Johan Sebastian Bach.

I decided to work on this piece for the following reasons. First, I wanted to experiment this kind of practice on a piece that was stylistically different than the "Introduction und Variationen über *Trockne Blumen,"* op. 160 by Frantz Schubert. Second, and the most important reason, the interpretation of this piece requires an extended palette of tone colors and a special treatment of the musical discourse in order to get a balance between the phrasing – molar - and the multiplicity of motivic cells - molecular. Third and last reason, I played this piece for many years and I was never satisfied with the way I was playing it. I felt that I did not have enough means to do an interpretation that was stylistically appropriate. I was feeling like someone trying to make a speech but not finding the right words to express what he/she really wanted to say.

When working with this piece, I followed the same path as when working on the previous one. The first step consisted in deciding the places for breathing and the type of breathing that could fit better. Then I sang the piece many times with different vowels, trying to discover which vowel would give me the most appropriate and desired color. Of course, I already had in my mind the image of how the piece should sound like, as an ideal interpretation.

Matching the vowels for a good sympathetic resonance

As I showed in the previous pages, vowels have pitch, and consequently by reinforcing the partials of a certain vowel trough shaping the resonators in a determinate way, "...the vowel will benefit from sympathetic resonance and gain in quality and projection. Maximum amplitude (super-position) is achieved..." (Docher, 1994, p.136).

Another reason for trying out all the vowels is because "... generally speaking, certain vowels work better for the different registers of the voice than other vowels" (Foote, 1989, p. 59). My idea was that if I will achieve a desired resonance when singing, I could then use the resonators in the same way when playing the flute, thereby modifying the colors of the flute tone.

After a period of practice consisting of singing the piece and trying to discover which vowels were serving better for my purpose, I reduced the numerous possibilities, to just two or three. I then transported these vowels for playing flute and made the final choices. The next examples show my final decision for certain vowels (Examples 10, 11, 12, and 13),

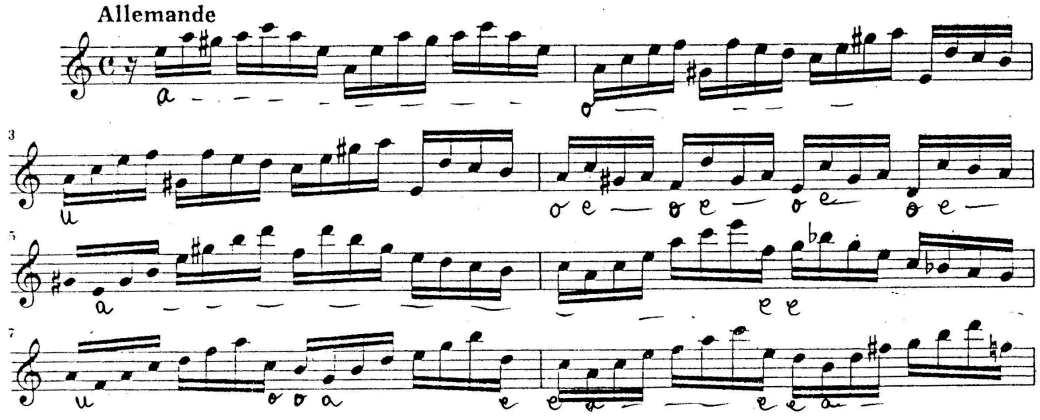


Figure 18 Example 10

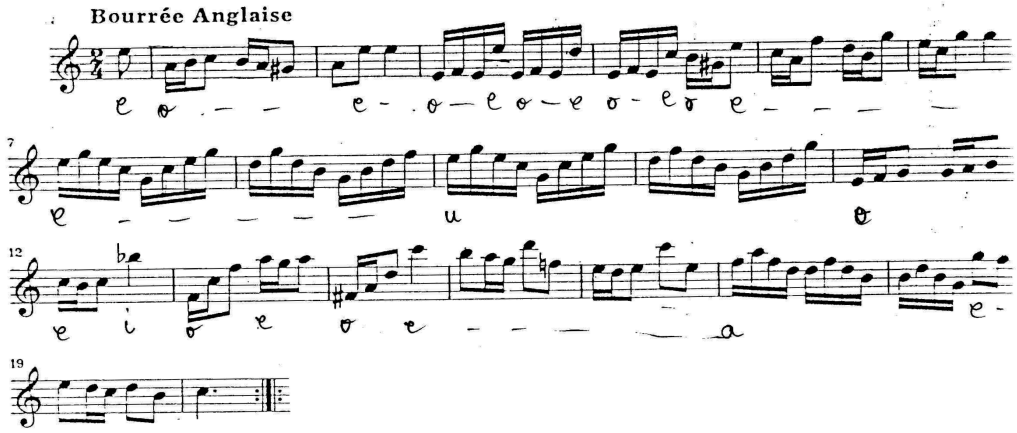


Figure 19 Example 11

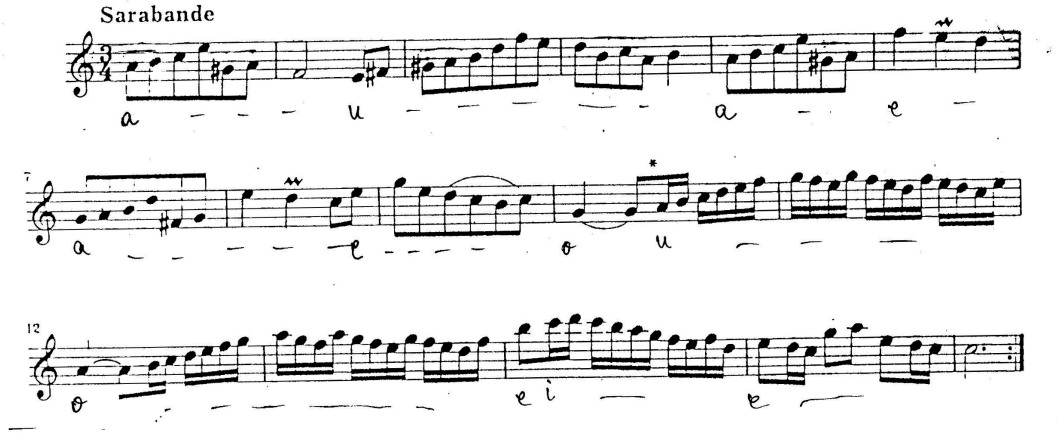


Figure 20 Example 12

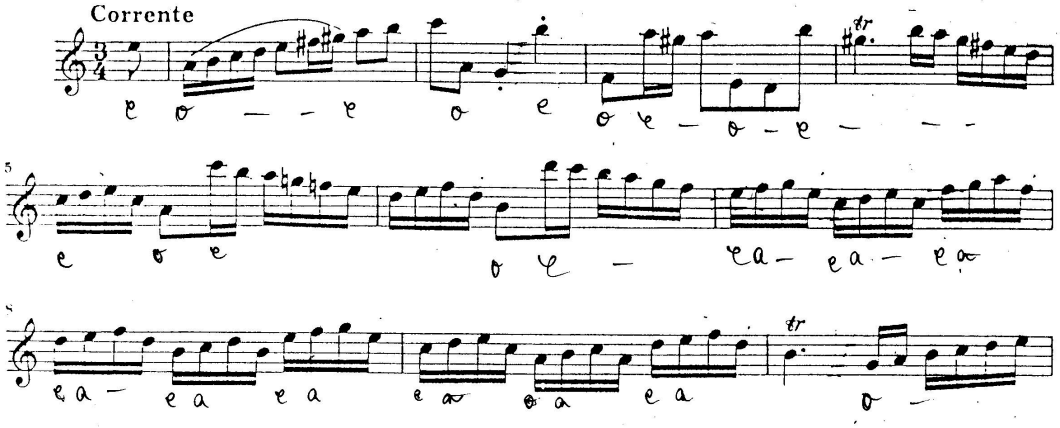


Figure 21 Example 13

As I said before, all vowels have pitch and a consequence of using the sympathetic resonance when playing the flute is that the flute tone can be altered.

For finding the perfect matching between the vowels and the flute tone, I tried the following method: I empirically experimented finding the perfect sympathetic resonance for each vowel (I tried the vowels in all of the flute range at all dynamic levels). I guided my search using the pitch of the vowels' formants (see Figure 14) and the position of the vocal resonators - mouth, throat, velum, and lips -, (see Figure 15) in order to find out when perfect optimum resonance is reached.

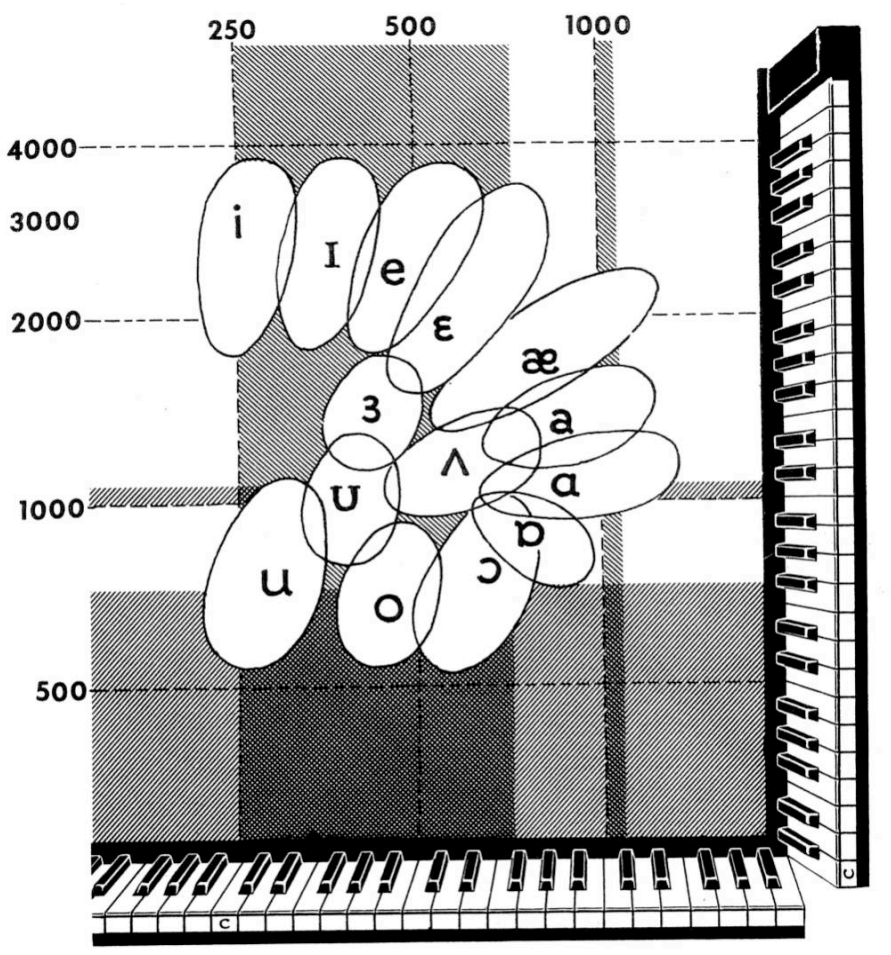


Fig. 60. Formants of English Vowels
Based on data from Denes and Pinson, Fairbanks, Peterson and Barney. Low formant frequency plotted on graph from left to right. Second formant frequency plotted from bottom to top. Average locations indicated by IPA symbols. Egg-shaped overlapping areas based on Peterson and Barney, showing that there is wide latitude in frequencies the ear will accept for a given vowel under differing circumstances, and same acoustic signal may be perceived as one vowel one time and a different vowel at another. Shaded areas show the easy range of the soprano voice, and narrow bands suggest upper limit at C_6. Only vowels [ʊ, ɑ, a, æ] can be produced normally in soprano's upper voice, (Par. 565–571).

Figure 22 Formants of English Vowels (Vennard, 1967, p.137)

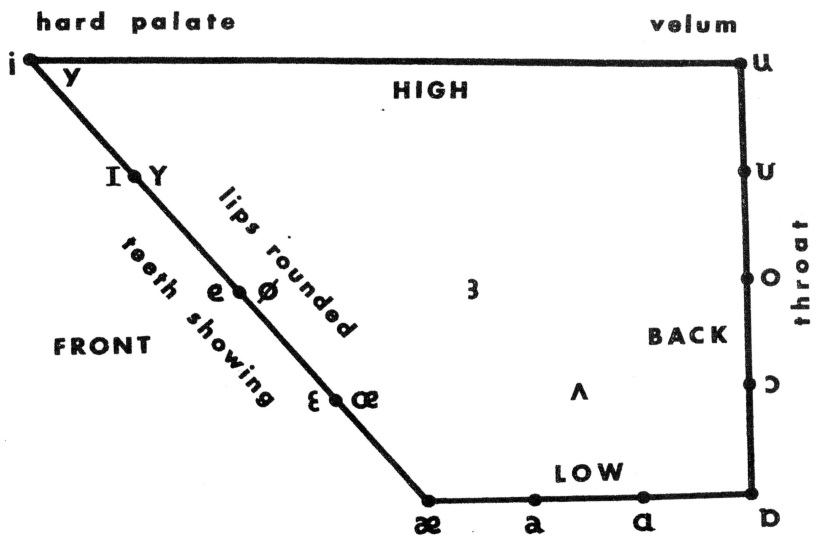


Figure 23 Chart of Tongue Positions for Vowels (Vennard, 1967, p.136)

When experimenting with matching the vowels for the desired flute tone quality I oriented myself by the First and the Second Formant of each vowel. What I did was empirically fitting the pitch of the vowel formant with the pitch and timbre of the tone for each register. The vowels I mention in the following section represent a simplified orientation because I also used their phonetic variation, in order to achieve optimum resonance.

Matching the vowel A

After empirically matching the vowel *a*, as in "f<u>a</u>ther", by testing it on all the flute rage and dynamics I came to the following conclusion: vowel *a* gives a full body and rounded sound if it is used in the middle register. It gives a penetrating sound without being harsh or irritating; I found it proper for playing with an *mp* to *mf* dynamic.

Then, I tried to find a possible explanation for this fact by empirically comparing it to the position of the vowel in the Formant

Ranges Chart and in the Chart of the Tongue Position for Vowels. The result is very interesting.

As it is given in the chart of Formant Ranges the vowel *a* and its phonetic forms have the First Formant around 600Hz[1] and 1400Hz. That is approximate in the middle and the first half of high register. The Second Formant is around 1000Hz and 3000Hz, which is in the high and very high register. The position of the First formant corresponds to the empirical result I found — that this vowel gives best resonance if used in the middle register. The position of the tong is *low*, which indicates that the resonating space is inside the mouth. Going further with the empirical deduction, the mouth is in the middle of the vocal tract[2].

I experimented with the other vowels in the way I explained above, and will give now the conclusions I drew from experimenting with the other vowels at different ranges with different dynamic levels

Matching the vowel E

When experimenting the vowel *e as in "where"* on playing the flute I found that it gives a powerful, brilliant and incisive sound if one uses it in the middle register. I found the *f to ff* dynamic range to be the most appropriate one. An empirical explanation for this conclusion could be that the First Formant for this vowel (with all it's phonetic forms) begins in the upper half of the low register (400 Hz), and finishes in the first half of the high register (more than 1200 Hz).

[1] All the frequencies are approximate.
[2] See Chapter II, Figure 3.

The resonating space in the mouth, that is in the middle of the vocal tract.

Matching the vowel I

After testing the vowel *I,* as in "see" or "heat," in all the registers and dynamics, I found that this vowel gives the same qualities of tone as the vowel *e* if one uses it in the high register. An empirical explanation for this might be that the Second Formant of the vocal *I* (with all it's phonetic forms) is between 2000Hz and 3500Hz. also, the resonating space is in the upper part of the vocal tract.

Matching the vowel O

For the vowel *o*, as in "home", I find that it gives a powerful, rounded brilliant and penetrating sound, if one uses it in the low register, and I preferred it for the *f* to *ff* dynamic range. When looking at the Formant Chart one can see that the vowel o (with all it's phonetic forms) has the First Formant between 400Hz and 800Hz and the Second Formant around 1000Hz. This fact could explain the fact that this vowel gives a powerful and penetrating sound in the low register. Also, the resonating space for the vowel *e* is in the back part of the vocal tract, in the throat, and with a lower position of the tongue (a large resonating space). I tried to go further with the empirical explanation and I found out that by singing this vowel, the soft palate closes thus closing the upper resonators of the vocal tract.

Matching the vowel U

After experimenting the vowel *u* as in "f<u>oo</u>t", I found an unusual result: It matches for all the registers in the *p* to *mp* dynamic range. It gives a tender, delicate, and sweet tone color and, at the same time, it has a good projection. I imagined the following empirical explanation for this fact: the First Formant is around 250Hz and the Second Formant is between 500Hz and 1000Hz, which could have as an effect a very poor area of resonance. In addition, in the Chart of Tongue Position vowel *u,* with all its phonetic forms, is on the higher part of the throat and the position of the tongue is also high. These two aspects brought together may yield another explanation —the high position of the tongue shuts down the resonating space from the mouth, making it possible for the throat to resonate with the vowel *u* in all the registers.

It should be important to emphasize that these are only empirical presumptions and that a more detailed study is needed. However, these empirical conclusions gave me the guidelines for working on the Bach's Partita.

I used these guidelines in my flute playing and I should say that I think that I have reached satisfactory results, which are given for appreciation in the recital that complements this dissertation. I also intend to further investigate these issues in order to optimize the matching of the vowels for a better sympathetic resonance and find a more scientific explanation for these facts.

Conclusion:

In this study, I formulated the hypothesis that singing techniques can be helpful for improving the flute tone. In order to investigate this problem, I started by learning about singing and attending singing classes. I started introducing exercises and strategies from the singing technique in my flute practice. I also did research in the literature about singing in order to have a clear image about the act of singing. I then created some exercises, inspired on vocalizes and started to use them regularly in my flute practice. After being able to sing in a relatively good manner, I started to notice changes in my flute tone. I felt that my tone had improved in resonance and consistence; it became clearer and more penetrating. In addition, it was more flexible and I was able to create more tone colors. At the same time, I felt that my breathing technique had improved, and I was able to better coordinate the breathing muscles and the air. I also felt that the breathing exercises from the singing technique gave me an alternative way of aurally experiencing the conscious complete breathing.

Having noticed considerable improvements in my flute playing, I decided to extend the use of singing to the study of my repertoire. In parallel, I continued the singing classes and took classes in singing pedagogy.

I also felt the use of singing for my repertoire very fruitful. I was able to find much faster the tone qualities that helped me to achieve the desired interpretation. I realized that this method of practice brought improvements to my flute playing, by giving me alternative ways of understanding and solving the problems that I

was confronted with in my study. I then realized that it was the time to experiment these methods of practice with other flutists. From the exercises for daily routine I extracted two exercises with which I made experiments with the volunteer students. I only chose to experiment two exercises since experimenting them all I would have taken a much longer time.

In order to better ascertain the benefits of this practice method, I experimented the exercises with the other flutists and I used empirical observation and interviews. The volunteer students' feedback was positive, as they felt that this kind of practice represents a useful alternative method for improving their flute tone in the following aspects:

- Breathing control and air coordination,
- Sound production process,
- Tone consistence,
- Flexibility of the tone,
- Tone color
- Intonation.

When doing the experiment with the flute students I have noticed that some of them were having difficulties in singing. They were having problems finding the pitches, and that was not because of their voices, but because of the fact that the internal ear was not trained. So they could not control the internal ear and they were not familiar with the sensation that one has when hearing the note in his mind before producing it and hearing it. After doing the exercises in a correct manner and being able to sing in tune, the students started to improve the internal ear and though this they were able to improve the intonation and the coordination of the air column.

In addition, I did spectral analyses of fragments from the exercises I proposed, played by myself or by other flutists. The spectral analyses showed a noticeable change in the flute tone. This confirmed the results from the previous experiments, and the hypothesis of this study: applying singing techniques to the flute playing can help to improve the quality of the flute tone.

In the end of this study, I presented the way I applied singing techniques when practicing flute repertoire. I gave examples of how I worked on the "Introduction und Variationen über *Trockne Blumen,"* op. 160 by Frantz Schubert and the "Partita in A minor" for flute, (BWV 1013) by Johan Sebastian Bach. In this latter piece, I used an aspect of the singing technique that I had not used before: I utilized the vowels when playing the flute for achieving the best sympathetic resonance. As I had previously done spectral analyses of the tone in order to see if the vowels could influence the flute spectrum, I then did experiments for finding how each vowel could be used for improving the flute tone.

Throughout this study, an innovative practice methodology was developed that may contribute to the improvement of the flute tone and awareness in flute playing if used correctly.

As guidelines for further study, I would suggest:

- To extend the number of case studies using this method with many other flutists;

- To further develop the acoustical research in order to get more objective data in order to endorse the principles of this methodology

- And finally to do an acoustical research on matching the vowel with the flute tone for achieving the best sympathetic resonance of the vocal tract.

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